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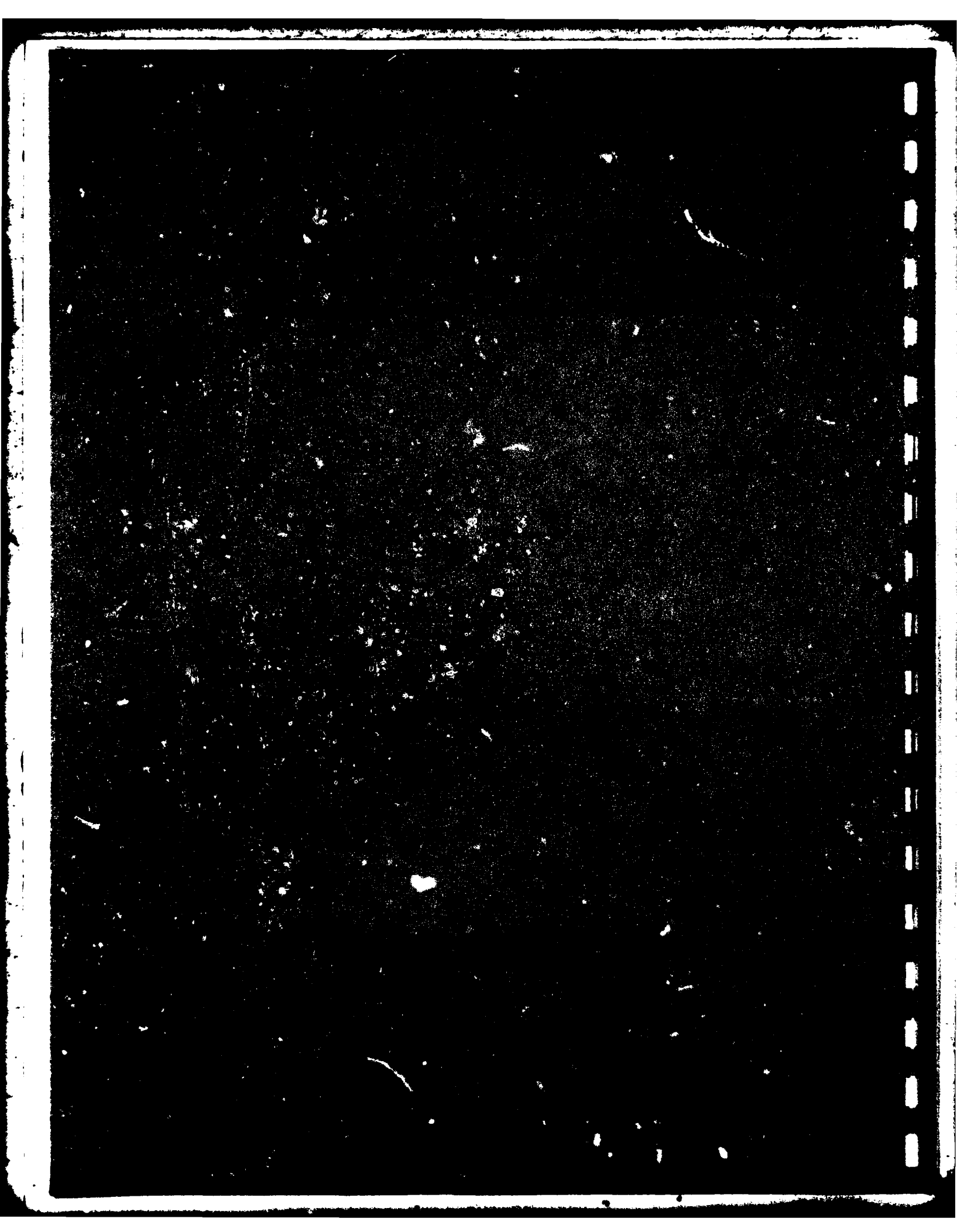
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the new Environmental Quality Evaluation Procedures (EQEP). An implicit emphasis is placed on more quantitative, analytical approaches to measurement, impact assessment, and forecasting which provides the basis for evaluation. The linkage of forecasting techniques to evaluation methods requires the greatest methodological development in future OCE guidance. The EQEP emphasis on a more analytical and quantitative approach to forecasting and evaluation is aimed at improving the quantitative tradeoff analysis and net effects assessment steps.

The EQEP are valuable procedural guidelines which create an internally consistent planning evaluation framework. The increased rigor inherent in the specification of problems and opportunities and the identification of resources and measurement techniques forces a more traceable and ultimately rational EQ planning philosophy. The EQEP, however, must be more clearly linked to the overall planning process to show the relationship of EQ effects assessment to plan formulation, evaluation, and EQ plan designation. On balance, it was found that many reports were poorly organized, thereby hampering decision traceability. Much of the information required by the EQEP, however, was developed in many reports for essentially similar requirements of the ER 1105-2-200 series. The information was simply not used effectively nor was it documented and displayed to enhance tradeoff analysis, net effects assessment, or EQ and NED plan designation. Therefore, it is concluded that the EQEP are not expected to impose a significantly increased burden for data collection.

Both the parent Principles and Standards (P&S) and the EQEP are stated in a rhetorical level of abstraction which may easily confuse the field planners without transformation into illustrative examples based on Corps mission areas and functional responsibilities. The EQEP thus appears to be complex. However, as a rational framework for evaluation, which brings the level of analysis to a comparable basis with NED procedures, the EQEP emphasizes a higher degree of methodological accountability and decision traceability. The increased evaluation rigor will result in plans which are more responsive and will withstand changes in public values.

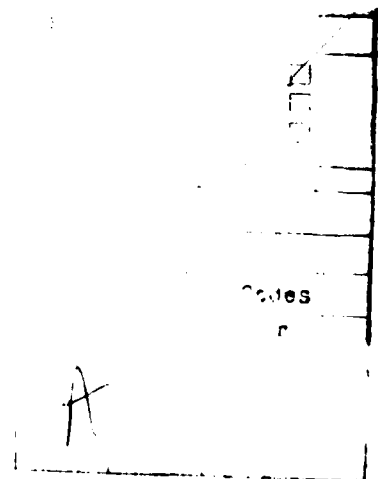
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FOREWORD

This research was performed for the Office of the Chief of Engineers (OCE) by the U.S. Army Construction Engineering Research Laboratory (CERL), Champaign, IL, and the Institute for Water Resources (IWR), Fort Belvoir, VA. The work was performed under IAO, CWP-P-80-4, dated 29 August 1980 and CIAO 81-22, dated 2 December 1980. CERL's portion of the research was conducted by the Environmental Division (EN), and IWR's portion of the research was conducted by the Policy Studies Division. The OCE Technical Monitors were Dr. John Belshe and Mr. Alex Otto.

Dr. R. K. Jain is Chief of CERL-EN. Mr. K. Schilling is Chief of the IWR Policy Studies Division. COL Louis J. Circeo is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director. Mr. J. R. Hanchey is Director of IWR.



APPRAISAL OF
SELECTED CORPS PREAUTHORIZATION REPORTS
FOR
ENVIRONMENTAL QUALITY PLANNING AND EVALUATION

PART I: EXECUTIVE SUMMARY

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PART II: CASE HISTORY STUDIES

The case history studies, which contain 14 preauthorization-report detailed reviews, are not included with this report. Limited copies of this document are not for distribution.

SECTION A

INTRODUCTION

Purpose

The Office of the Chief of Engineers, Planning Division, tasked the Engineer Institute for Water Resources (IWR) and the Construction Engineering Research Laboratory (CERL) to assess the status of environmental planning and evaluation in survey reports passed by BERH since 1976. More than 140 feasibility reports which had passed through the Board since 1976 were screened for compliance with the ER 1105-2-200 series of planning regulations, issued in 1975. Subsequently, 14 reports were selected for detailed analysis, with emphasis on impediments to, and opportunities for, Environmental Quality (EQ) planning and evaluation. The basic report evaluation perspective was to note the degree of conformance to the existing "200 series" of planning regulations and identify the obvious shortcomings (i.e., those that hampered fundamental planning functions or decisions). The requirements of the new Environmental Quality Evaluation Procedures (EQEP) (18 CFR 714) were compared to those of the "200 series" to determine if they unnecessarily made the planning process longer or more complex. Finally, the EQ planning problems derived from the analysis were matched with the potential of the EQEP to help resolve them.

Scope

The case study approach was selected to learn about difficulties encountered in implementing the relatively new and perhaps abstract planning philosophy embodied in the Corps' planning regulations. The selected survey reports encompassed six Corps mission areas (navigation, flood control, water supply, hydropower, beach erosion and hurricane protection, and urban studies) and covered at least one project in each Corps Division and in each mission area.

The focus of case study review and appraisal was on seven primary issues related to EQ evaluation emphasized in the EQEP:

1. Identify and define the significance of the EQ resources and their attributes.
2. Classify measures for resource management.
3. Record indicators and units used to describe resource attributes.
4. Evaluate techniques used to measure EQ attributes.
5. Compare documentation and information display with those required and/or suggested by the EQEP.
6. Critique the rationale for EQ justification.
7. Characterize subsequent OCE and BERH review actions.

Section B addresses each of these primary evaluation issues and provides a summarized tabular form of the key observations and findings derived from each case study. Section C covers the planning process, which is invariably linked to evaluation, and has been covered as a natural byproduct of the primary analysis.

Procedure

The first step in selecting a manageable set of case studies was to develop a few basic preselection criteria. The analysis had to cover the range of Corps responsibilities represented by the seven mission or functional areas of navigation, hydropower, urban studies, flood control, beach erosion and hurricane protection, water supply, and multi-purpose projects. The selected case studies had to represent diverse geographic (Corps Division) and physiographic environments. In addition, they had to possess some unique EQ-related problems or opportunities or EQ-oriented solutions. These qualitative criteria were derived from several interviews with OCE and BERH staff. Fourteen case study reports were selected from a list of about twenty-five. Unfortunately, a multi-purpose project report which met these simple criteria had not passed through BERH during the requisite time period. Table A-1 lists the final set of survey reports selected for analysis.

The next step was to organize a uniform framework for analysis, so that each of the six individuals reviewing the assigned reports would be able to systematically and consistently develop the requisite information. Table A-2 shows the outline used to structure the case study inquiry. Each survey report is summarized and documented according to this format. The 14 case studies make up Part II of this appraisal.

The last step in the appraisal process was summarizing the case study information into a series of tables. The tables array the synthesized, highlighted information for all 14 studies to enable rapid, comparative appraisal.

Documentation

The tables discussed above abstract much of the relevant background material from the detailed case study appraisals. These tables provide a convenient format for comparative analysis and support the basis of the findings and conclusions for each topic. The material provided in Section C, which relates to EQ planning, was derived from a more qualitative appraisal of associated planning factors which might directly affect the conduct of EQ evaluation. Section C was based, to a large degree, on each case study analysis of EQ planning performance objectives (understandable, traceable, significant, analytical, etc.).

The tables were constructed to reflect and summarize information requirements within the new EQEP; however, much of the information in most reports was simply not organized in a conveniently traceable format or sequence. A great deal of effort was expended by the study team to cull out the relevant information from a variety of sources other than the main report. In addition, a substantial amount of information was inferred, deduced, or imputed.

Table A-1
Selected Case Studies Reviewed
Distribution by Purpose

<u>BERH Reports (Favorable Action)</u>	<u>Reviewer</u>
1. NAVIGATION	
Wilmington Harbor	IWR
Grays Harbor	IWR
Tampa Harbor	CERL
Lake Ponchartrain, N. Shore, LA	CERL
Mobile Harbor	IWR
Norfolk Harbor	IWR
2. FLOOD CONTROL	
Fourche Bayou, AR	IWR
Cache Creek, CA	IWR
Central Ohio Survey, Hocking Creek, OH	IWR
Burnett-Crystal & Scott Bays, Baytown, TX	IWR
3. HYDROPOWER	
Lucky Peak, ID	CERL
4. WATER SUPPLY	
Hudson River Project	IWR
5. BEACH EROSION/HURRICANE PROTECTION	
Folly Beach	IWR
6. URBAN STUDIES	
Kansas City Metro Area	CERL

Table A-2
Case Study Analysis
Table of Contents

1. Study Authorization
 - Description of authorized study components
 - History of study
 - Map(s) of study area
 - Recommended plan (map)
 - (measures for management in recommended plan)
2. Inventory of EQ Resources
 - Identify EQ resources, attributes, indicators, units, guidelines, and measurement techniques
 - Inventory and forecast "baseline," "with," and "without" conditions
3. Plan Formulation
 - EQ planning objectives, stages 1, 2, 3
 - Management measures, separable plans, components
 - Designated EQ plans
 - Discussion on table of alternative plans
4. Effects Assessments
 - Assess effects of each plan (stages 1, 2, 3) and/or separable components/measures
 - Identify, describe, determine significance
 - Net effects
 - Assessment techniques
5. Rationale for Recommended Plan, EQ Justification
 - Display plans
 - Compare effects
 - Designate EQ, NED
 - Select plan
6. Summary of Report Compliance to EQ Procedures
7. EQ Planning Performance Objectives Discussion
 - Understandable
 - Traceable
 - Significant issues
 - Analytical
 - Comparable and uniform level of detail
 - Valid, acceptable precepts
 - Problem rather than goal/solution orientation
 - Complete, timely input into overall decision-making
8. BERH Summary Analysis

The overriding factor, however, is that despite the overall lack of report organization and generally weak decision traceability, much of the requisite information was encountered somewhere in the report documents. Therefore, it can be concluded that the EQEP should not impose a substantial additional burden of data collection. Rather, it provides a clearer and more rigorous framework for evaluation, documentation, and display.

SECTION B

APPRAISAL OF EQ EVALUATION

This section appraises the viability of certain EQEP requirements and the anticipated degree of conformance and potential difficulties which Corps planners may be expected to encounter under the revised planning and evaluation structure. The seven primary areas of concern are:

1. EQ resource-significance identification.
2. EQ resource management measures.
3. Indicators to describe EQ resource attributes.
4. Techniques to measure EQ resource impacts.
5. Documentation required and suggested by the Principles and Standards (P&S) (18 CFR 711) and EQEP.
6. Rationale for EQ justification.
7. Corps review process.

Each requirement is an interdependent element of both the planning process and the EQ evaluation phases. Each phase and activity has several prerequisites which must be fulfilled in order to conduct succeeding activities in a consistent and traceable manner. The structure of the current planning and evaluation process specifically places greater emphasis on early scoping, coordination, and specification of problems and opportunities (planning objectives). The forecasting activities which are central to the development of "with-plan" and "without-plan" futures and derivative impacts rely heavily on early agreement of an evaluation framework.

Each of the seven topics listed above has been addressed in the detailed case studies (PART II) and is backed by tables which summarize or abstract the key elements related to the seven topics for each of the 14 case studies.

EQ Resources Significance Identification

Background

The Principles and Standards require that the Inventory and Forecast step of the planning process include an "inventory to be made to determine the quantity and quality of water and related land resources of the planning area and to identify opportunities for protection and enhancement of those resources. The inventory is to include data appropriate to the identified problems and opportunities, as determined by scoping, and the potential for formulating and evaluating alternative plans" (18 CFR 711.40). The EQEP evaluation phase which requires defining the resources is divided into two activities: identification of resources and development of evaluation

framework. "In the first activity, EQ resources and attributes to be evaluated are identified on the basis of their significance and their likelihood of being affected by an alternative plan. In the second activity, an evaluation framework is developed for measuring or otherwise describing the condition of identified EQ resources..." (18 CFR 714.410).

The basis for identifying EQ resources and attributes is: (1) significance based on institutional, public, or technical recognition, and (2) Likelihood of being affected by one or more of the alternative plans. Development of an evaluation framework places a great deal of emphasis on correctly selecting appropriate indicators for measuring or otherwise describing existing and future conditions and the effects of alternative plans.

Thus, we see that identification of significant EQ resources presents several important criteria and feedback loops:

1. Must be related to problems and opportunities.
2. Must possess significant institutional, public, or technical recognition.
3. Must state the likelihood of being affected (impacts) by an alternative plan.
4. Should possess some descriptive parameter or indicator(s) for representing the attributes of the resource for forecasting.
5. Should be explicitly linked to opportunities for enhancement, protection, restoration, or preservation.
6. Should identify resource limitations and constraints toward realizing potential.

Therefore, the new EQEP requires a more explicit, better-documented inventory of resources which will be used in the forecasting core of the planning process. Most of the studies reviewed as part of this project loosely met the current (ER 1105-2-220) guidance requiring a description of "resource management problems" and a "description of the base condition" which includes the resource base. The connection between resources and planning objectives (problems and opportunities) was implied, however. Even more tenuous was the necessary linkage between the resource base and the derived indicators to be used in forecasting future conditions. Thus, a substantial degree of improvement shall be required from the field planners because of the emphasis on developing an evaluative framework early. This change would improve the present "ad hoc" system without adding substantially to the overall planning effort.

Findings/Conclusions (Refer to Table B-1)

o Resources most often identified explicitly were those anticipated to be directly affected by the proposed alteration, thereby revealing a relatively narrow view of the planning area.

o There is much ambiguity between the relationships of resources and the definition of the planning area, both under the old and potentially under the new planning guidance.

o Most studies did not expressly identify significant impacts/resources. However, based on public comment contained primarily in the EIS, it appeared that most impacts/resources discussed within the document appeared to be significant.

o Most studies did not cite why certain impacts/resources were significant, partly because of their reluctance to cite guidelines and techniques.

o Resources were not consistently defined or inventoried; there was little regard for their ultimate link to forecasting and evaluation.

o Resources were perceived differently in each study and possibly among members within the same team. Reports often consider the entire study area as a resource. Some studies identified resources without adequate justification.

o The P&S, EQEP, and NEPA implementation guidelines more than adequately define the planning area, study area, project areas, and affected area and their relationship to resource identification and tests of significance.

o The identification of EQ resources is a vital prerequisite to formulating EQ plans which are linked to fulfilling EQ-oriented problems and opportunities. It is important to understand that an EQ resource must not necessarily be pristine or highly valued. There are many opportunities for restoring degraded resources.

o The EQEP tables of resource documentation serve two vital purposes and should therefore be adopted: (1) they provide the field planner with a framework to view resources consistently and from a positive EQ orientation; and (2) they require documentation of the source of relevant information, thereby enhancing traceability and providing a rationale for the EQ evaluation framework.

Table B-1
IDENTIFICATION OF RESOURCES AND INDICATION OF SIGNIFICANCE
BASIS FOR PRIMARY SIGNIFICANCE RECOGNITION

STUDY	RESOURCE	PUBLIC	INSTITUTIONAL	TECHNICAL
FOLLY BEACH	Shoreline	Public support (E)	Study Authorization (E)	----
FOURCHE BAYOU	Fourche Bottoms	Public support (I)	Arkansas Planning Commission (E)	Ecosystem function (E)
			Arkansas Game & Fish Commission (E)	Hydrologic Function (E)
	Archeological Sites	----	Arkansas Archeological Survey (E)	----
	Historic Sites	----	State Historic Preservation Program (E)	---
	Urban Open Space	---	Arkansas State Recreation Program (E)	---
	Water Quality	---	State Health Dept (E) Public Health Dept (E)	---
	Fish & Wildlife	---	State and Federal Lists (E)	---
	Aesthetics	National and local environmental awareness (E)	---	---
WILMINGTON HARBOR	Biological Productivity	---	---	Ecosystem function (E)
	Diversity of Habitat	---	---	Environmental richness (E)
	Selected Wildlife Values	Societal concerns (E)	Government Acts & Directives (I)	National interest (I)
	Contribution to Estuarine Productivity	---	---	Ecosystem function (E)
	Unique Areas	---	State & Federal Lists (E)	---
	Natural Beauty	Local awareness (I)	Governmental Acts & Directives (E)	National interest (I)
	Archeology/History	---	Governmental Acts & Directives (E)	National interest (I)
HOCKING RIVER	Vegetation	Hardwood trees Valued (I)	U.S. Forest Service (E) Ohio DNR (E)	
	Wildlife		U.S. Fish & Wildlife (E) Ohio DNR (E)	
	Fish	Current fishing pressure (I)	U.S. Fish & Wildlife (E) Ohio DNR (E)	
	Water Quality		Ohio Water Quality Standards (E) EPA (E)	
	Archeological Sites		Advisory Council (E) Ohio S.H.P.O. (E)	

(E) = explicit
(I) = implicit

Table B-1 -- Continued
 IDENTIFICATION OF RESOURCES AND INDICATION OF SIGNIFICANCE
 BASIS FOR PRIMARY SIGNIFICANCE RECOGNITION

STUDY	RESOURCE	PUBLIC	INSTITUTIONAL	TECHNICAL
GRAYS HARBOR	Water		Wash. Dept of Ecology (E) U.S. EPA	
	Soils and Sediments		Office of Coastal Zone Mgmt (E)	
	Terrestrial and Marine Ecological Functions	Commercial interest (I) in oysters & salmon	All Natural Resource (I) Coord. Agencies	Known food web relationships (E)
	Vegetation			Known food web contributions (E)
	Benthic Organisms			
	Fish	Commercial interest (E)	Wash Dept of Fisheries (E) U.S. FWS (E) Nat'l Marine Fisheries Service (E)	
	Avian Fauna (Endangered Species Waterfowl)		U.S. FWS (E)	
	Mammalian, Fauna (esp. Harbor Seals)		U.S. FWS (E)	
CACHE CREEK	Sedimentation and Erosion		Alluded to in study authorization from Congress (I)	
	Water Quality	Perceived as problem by residents in Yolo and Lake Counties (E)		
	Fish & Wildlife			Enhancement of wildlife habitat in study area were specific objectives of State of California (I)
	Hydrologic		Stated in study authorization (E)	
	Archeological		Archeological and Historic Preservation Act (I)	

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Table B-1 -- Continued
IDENTIFICATION OF RESOURCES AND INDICATION OF SIGNIFICANCE
BASIS FOR PRIMARY SIGNIFICANCE RECOGNITION

STUDY	RESOURCE	PUBLIC	INSTITUTIONAL	TECHNICAL
NORFOLK HARBOR	Archeological		Archeological and historical presentation (I)	
	Commercial Fisheries			Identified by reviewing agency as an oversight in feasibility study (I)
	Forest Acreage			Discussed in feasibility report (E). No rationale for importance given
	Tidal Influences on James River			Salinity and chlorinity of waters discussed in report (I)
	Dismal Swamp) Soils)		Dismal Swamp is a national wildlife refuge (E)	
	Vegetative) Communities)			
	Wildlife) Habitat)			
BAYTOWN	Water Quality			Degraded conditions discussed in feasibility report (I)
	Terrestrial Habitat of 90 Acre Marsh			Discussed in feasibility report; presumed to be important (I)
	Aquatic Habitat of Study Area			Discussed briefly in feasibility report; presumed to be important (I)
	Historical/ Archeological		Archeological and Historic Presentation Act (E)	
	Terrestrial Habitat of Coastal			Discussed briefly in feasibility report; presumed to be important
TAMPA BAY	Aquatic Habitat	Public Support (I)	Florida Dept of Natural Resources (E)	---
	Archeological Sites	---	State and Federal Inventories	National Register of Historic Places (E)
	Fauna	---	Florida Dept of Natural Resources (E)	---
	Flora	---	Florida Dept of Natural Resources (E)	---
	Water Quality	Public Support (I)	Florida Dept of Environmental Protection (E)	---

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Table B-1 -- Continued
 IDENTIFICATION OF RESOURCES AND INDICATION OF SIGNIFICANCE
 BASIS FOR PRIMARY SIGNIFICANCE RECOGNITION

STUDY	RESOURCE	PUBLIC	INSTITUTIONAL	TECHNICAL
KANSAS CITY	Aquatic Habitat of Stream	Public Support (E)	State and Local Laws (E)	National Interest (I)
	Riparian Forest	Public Support (E)	State Inventories	---
	Agricultural Production	Public Support (E)	Regional Interest (E)	---
	Population Distribution		Regional Interest (E)	---
	Recreation	Public Support (E)	State Inventories (E) and Program	---
	Esthetic	Public Support (I)	---	---
	Archeological	Public Support (E)	State and Federal Inventories	National Interest (I)
LAKE PONTCHARTRAIN	Archeological Sites		Louisiana Archeological Survey & Antiquities Commission (E)	On-the-Ground Survey by a professional consultant (E)
			State Art, Historical and Cultural Preservation Agency (E)	
			National Register of Historic Places (E)	
	Fontainebleau State Park		Louisiana State Parks and Recreation Commission-State Comprehensive Outdoor Recreation Program (E)	
	Historic Sites		State Art, Historical and Cultural Preservation Agency (E)	On-the-Ground Survey by a professional consultant (E)
			National Register of Historic Places (E)	
	Lake Pontchartrain Habitat			Bibliographical (I) U.S. Fish and Wildlife Service (E) State of Louisiana Wildlife and Fisheries Commission (E)
	Lake	Minor Public	U.S. Environmental	

(E) = explicit
 (I) = implicit

Table B-1 -- Continued
 IDENTIFICATION OF RESOURCES AND INDICATION OF SIGNIFICANCE
 BASIS FOR PRIMARY SIGNIFICANCE RECOGNITION

STUDY	RESOURCE	PUBLIC	INSTITUTIONAL	TECHNICAL
	Pontchartrain Sediments	Concern (I)	Protection Agency (E)	
	Lake Pontchartrain Water Quality	Minor Public Concern (I)	U.S. Environmental Protection Agency (E) Louisiana Stream Control Commission (E)	
	Lowland Marshes and Swamps			Bibliographical
	Shoreline	Public Interest and Support Thru Public Meetings (E)	Louisiana State Parks & Recreation Commission (E)	
	Streams	Public Interest and Support Thru Public Meetings (E)	Louisiana Stream Control Commission (I)	
LUCKY PEAK	Boise River	Officials of the City of Boise (E) Public Concern (I)	Idaho Department of Health and Welfare (I)	U.S. Fish and Wildlife Service (E) U.S. Environmental Protection Agency (I) Idaho Department of Health and Welfare (I) Ada/Canyon Waste Treatment Management Committee (I)
	Historical/ Archeological Sites		Idaho State Historical Society (I) National Register of Historic Places (E)	
	Irrigation Area	Public Concern (I)	Idaho Department of Water Resources (E)	
	Lucky Peak Lake	Public Interest (I)	U.S. Bureau of Reclamation (E) Boise River Board of Control (I)	U.S. Bureau of Reclamation (E) Boise River Board of Control (E)
	Lucky Peak Dam Site	Public Concern (I)		
	Recreational Development	Public Concern (I)	Idaho Department of Recreation-State Comprehensive Outdoor Recreation Program (E)	
	Wildlife Area Around the Lake		Idaho Fish and Game Department (I)	

(E) = explicit
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Table B-1 -- Continued
IDENTIFICATION OF RESOURCES AND INDICATION OF SIGNIFICANCE
BASIS FOR PRIMARY SIGNIFICANCE RECOGNITION

STUDY	RESOURCE	PUBLIC	INSTITUTIONAL	TECHNICAL
HUDSON RIVER PROJECT	Hudson River Estuary Ecosystem	Environmental groups, Fisher- men's Assoc., Recreational Assoc., Academic Organizations, Public meetings, Workshops	New York State, Dept. Env. Cons., Tri-State Commission, Counties along river	A number of extensive scientific studies, ongoing surveys.
	Water Quantity	Fishermen's Associ. Environ- mental Groups, Public meetings, Workshops	New York City Board of Water Supply Tri-State Commission Municipalities withdrawing water from Hudson River, Counties along river	U.S.G.S. low-flow studies, NYS Monitoring NYC Monitoring
	Water Quality	(Same as above)	New York State Dept. Environ. Conserv. Tri-State Commission New York City Board of Water Supply Municipalities, industry, counties along river	U.S.G.S. NYC Monitoring NYS, NYC: Continuous Monitoring
	Terrestrial Sites			
	(a) Habitat	Public meetings, workshops	Affected counties	Available literature, Land use maps, Soils maps.
	(b) Air quality Noise	----- -----	----- -----	NYS, EPA Standards NYS, OSHA Standards
	Urban Landscape	Public meetings, workshops	NYC Dept. Env. Cons. NYC Board Water Supply	Drought emergency studies
	Groundwater	Public meetings, workshops	NYS, NYC Nassau, Suffolk Counties	U.S.G.S. surveys, studies, monitoring
MOBILE HARBOR	Mobile Bay			
	(a) Estuarine Ecosystem	Commercial Fishermen	Federal agencies during EIS review	Corps DMRP Studies Alabama Geol. Survey
	(b) Estuarine benthos	Commercial Fishermen	Alabama, Federal Agencies	Corps DMRP Studies Data, Literature
	(c) Water Quality	-----	Mobile City	Corps DMRP Studies
	(d) Wetlands	-----	Alabama, Federal Agencies	-----
	(e) Shoreline	Property owners	Mobile, Corps	Erosion Studies
	(f) Cultural Sites		National register	Maps, navigation charts
	Barrier Islands			
	(a) Barrier Islands			Erosion Studies
	(b) Dauphin Is.			
Gulf of Mexico	(a) Water column		EPA	DMRP Studies
	(b) Benthos		EPA	DMRP Studies

(E) = explicit
(I) = implicit

EQ Resource Management Measures

Background

The P&S are fairly explicit in discussing management measures as part of the treatment of alternative plans (18 CFR 711.50). Projects are no longer discussed singularly. Instead, the P&S address "...possibilities for management, development, preservation, and other opportunities for action" (18 CFR 711.41). Furthermore, "by proper selection of these development or management possibilities, alternatives may be formulated for each problem or opportunity associated with NED and/or EQ objectives." The emphasis is clearly on alternative plans which consist of "...a system of structural and/or nonstructural measures, strategies, or programs formulated to alleviate specific problems or take advantage of specific opportunities associated with water and related land resources in the planning area."

Several requirements for creating alternative plans directly affect the development of the range of EQ management measures:

1. Plans are to be significantly differentiated from each other in terms of their effects on the NED and EQ objectives.
2. Plans are not to be limited to those which could only be implemented under Federal authorities.
3. Water conservation is to be fully integrated into plan formulation as a means of achieving NED and EQ objectives and consists of actions that will:
 - a. Reduce the demand for water;
 - b. Improve efficiency in use and reduce losses and waste;
 - c. Improve land management practices to conserve water.
4. Nonstructural measures are to be considered for all problems and opportunities.
5. Mitigation of the adverse effects of each alternative plan must be considered.
6. Other existing plans, such as state water resources plans, are to be considered as alternative plans, if they are within the scope of the planning effort.
7. Various implementation schedules for the alternative plans are to be considered.

While the terminology has changed, the intent of the new P&S is similar to the Corps' current guidance (ER 1105-2-230) to "identify management measures"; to classify "measures that address more than one planning objective"; to combine "compatible measures which address only one planning objective"; and finally to "combine different measures into resource management systems."

Specification of EQ-oriented management measures is determined partly by the requirements to consider conservation measures, nonstructural measures, and mitigation, partly by resource-related or constrained problems and opportunities, and partly by available technologies.

Findings/Conclusions (Refer to Table B-2)

- o Most of the studies did not meet the requirements of the current guidance (ER 1105-2-230) to identify and classify management measures according to their contributions to EQ and NED objectives.

- o Authorizing legislation is often interpreted as preventing consideration of a broader range of management measures, thereby narrowly circumscribing the problems and potential opportunities as well as the planning area.

- o The nature of some resource problems leads to a narrowed focus on specific solutions based on certain resource limitations; this makes a broad, comprehensive planning effort difficult.

- o Local support and perception of EQ resource management opportunities are often lacking, contributing to a dearth of imaginative management measures.

- o Management measures are closely tied to a perception of the planning area, which is often narrowly defined as the project impact area.

- o EQ management measures are generally not linked to any of the four elements of EQ (enhancement, preservation, restoration, protection). In reality, neither EQ management measures nor EQ elements are well understood. Mitigation is often emphasized as the relevant EQ measure.

- o EQ management measures are generally not linked to specific planning objectives (problems and opportunities) or to compatible planning objectives.

- o EQ management measures which are currently considered to be sound environmental engineering practice or design are not differentiated from less environmentally sensitive standard engineering practices; this eliminates the possibility of a structurally based EQ plan with net positive EQ effects.

- o Most studies did not display unique EQ-oriented or other non-traditional, management measures, but rather were often iterations of past engineering solutions.

- o The field planners often fail to take credit for accepted environmental engineering practices ("environmentally-oriented design features") which may be considered separate EQ management measures. These environmental design features are often integrated into the structural components of the project, but may be compared to more mundane standard engineering designs.

- o The general failure to directly link problems and opportunities (planning objectives) with compatible management measures hinders plan formulation and skews the tradeoff analysis phase of plan selection.

- o The failure to recognize structurally based EQ management measures stems from an uncertainty of what an EQ plan represents and what opportunities the EQ elements provide for separate management measures.

- o Often, there is no local sponsorship or support for EQ management measures, since EQ is viewed primarily as a Federal interest.

Table B-2
CLASSIFICATION OF MANAGEMENT MEASURES

STUDY	ALT MANAGEMENT MEASURES	EQ MANAGEMENT MEASURE	REMARKS
FOLLY BEACH	Relocate structures		
	Evacuation planning		
	Flood insurance		
	Zoning and building code modification		
	Flood plain regulation		
	Floodproof structures		
	No growth		
	Grass existing beach	Yes	Weakly related to plan objectives.
	No action		
	Beach restoration and nourishment	Yes	NED Plan & EQ Plan
FOURCHE BAYOU	Beach revetment		
	Seawall		
	Offshore breakwater		
	Sand dune development and stabilization	Yes	EQ Plan
	Dynamite hole closure		
	Beach access biological observation park	Yes	No public support
	Channel improvement:		
	Clearing & alteration		
	Land buffer (grass strip)		
	Bank protection		
WILMINGTON HARBOR	Bridge and pipeline alterations		
	Reservoirs		
	Flood plain regulations		
	Relocation or raising of structures		
	Acquisition of bottomland	Yes	EQ Plan
	Establishment of a Natural Area	Yes	EQ Plan
	Recreation trails	Yes	EQ Plan and NED Plan
	Tree planting beautification along enlarged channels	Yes	EQ Plan (EOD)*
	Use of gabions instead of riprap along some channels		NEQ, EQ, and Recommended Plan (EOD)*
	Conservation zoning	Yes	
HOCKING RIVER	Corps permit authority	Yes	
	State Coastal Area Management Act	Yes	All intended for wetland protection but none were both effective and implementable.
	Transferable Development Projects	Yes	
	Preferential Tax Assessment	Yes	
	Federal Acquisition Scenic Easement	Yes	
	Acquisition as estuarine sanctuary	Yes	
	Federal acquisition in fee simple	Yes	EQ Plan
	Navigation improvements (channel modification)		
	Reservoirs		
	Floodwalls/Levees		Wide setback to preserve riparian vegetation.
	Floodway Channel Modification		Single-bank channelization
	In-stream Deep Pools	Yes	Fishery enhancement
	Artificial Riffles	Yes	Fishery enhancement
	In-stream Rock Piles	Yes	Fishery enhancement
	Landscaping-Revegetation	Yes	Aesthetic, wildlife habitat
	Acoustical Mounds	Yes	Aesthetic
	Trail	Yes	Recreational access
	Riprap	Yes	Bank stabilization
	Scenic Corridor Acquisition	Yes	Halt further natural values degradation
	Stream Cleanout	Yes	Aesthetic restoration via trash removal
	Zoning		Gradual conversion to green space

* EOD = Environmentally oriented design feature

Table B-2 Continued

CLASSIFICATION OF MANAGEMENT MEASURES

STUDY	ALT. MANAGEMENT MEASURES	EQ. MANAGEMENT MEASURE	REMARKS
	Flood Insurance Building Code Regulations Temporary Evacuation Permanent Evacuation Flood Proofing Tax Reform Watershed Land Management		
GRAY HARBOR	Divert shipping to other ports. Lightering Pipelines Grays Harbor channel deepening and widening with deep ocean dredge disposal Grays Harbor channel deepening and widening with sidelands disposal waterfront renewal		
CLARK RIVER	Flood Forecasting Evacuation of the Flood Plain Flood Proof Existing Facilities Modify Operation of Clark Lake for Flood Control Reservoir Storage on Tributaries		EQ benefits of water quality and groundwater replenishment were not explored in report.
	Clear Lake Outlet Channel Enlargement Clear Lake Outlet Channel Enlargement and Modified Bypass	Yes	EQ design feature; Bypass would follow meandering alignment designed to enhance fish habitat. Part of EQ plan.
	Purchase of Anderson Marsh (530 ac) on Clark Lake	Yes	Part of EQ plan. Justification based on wildlife objectives by State of California.
	Raise Settling Basin Levees Raise Settling Basin Levees with Wildlife Refuge	Yes	Part of EQ plan. Convert present farmland in settling basin to 3600 ac refuge.
	Periodic Evacuation of Existing Settling Basin New North Settling Basin New South Settling Basin Kellner Jetty System Brooks Sediment Reservoir		
NORFOLK HARBOR	DISPOSAL SITES Raising Existing Levees at Craney Is. Westward Extension of Craney Is. Westward Extension Raised Willoughby Bay Ocean View Area Hampton Flats Horseshoe Area off Duckroe Beach Nagged Island Chesapeake Bay Suffolk Site Disposal at Sea by Tug & Barge Barging to Sea from Craney Is.		Considered the LED plan and NED plan

Table B-2 -- Continued
CLASSIFICATION OF MANAGEMENT MEASURES

STUDY	ALT MANAGEMENT MEASURES	EQ MANAGEMENT MEASURE	REMARKS
	Disposal at Sea by Pipeline Disposal at Sea by Special Dredge and by Tug Disposal by Truck Haul to Abandoned Mine CHANNEL IMPROVEMENTS EXISTING 45 FT CHANNELS Channel Deepening An Offshore Terminal Use of Coal Slurry Change in Trade Patterns Alternative Sources of Energy New Location of Coal Resources EXISTING 35 & 40 FT CHANNELS IN ELIZABETH RIVER Channel Deepening Pipeline Offshore Terminal		Considered LED & NED Plan
BAYSTOWN	Earthen Levees Concrete Flood Walls Flood Proofing Zoning Improved Flood Forecasting & Temporary Evacuation Permanent Evacuation and Relocation		Considered EQ & NED Plan
TAMPA BAY	Maintain entire East Bay Area. Dredged material placed on northern disposal island on the Tampa Harbor Report. Maintain 400-foot channel and turning basin in the East Bay. Dredged material placed on the northern disposal island of the Tampa Bay project.	No No No	The study never looked at separate, distinct actions which could, in turn, develop into separate plans. Further, no "measure" has any net positive effect.
KANSAS CITY	(Walnut Creek) Regulatory measures Floodproofing Relocation Detention Structure Channel Maintenance Channel Modification Bridge Modification	Yes No Yes No No No	Throughout study EQ measures were considered; however, there were no plans which emphasized EQ.

Table B-2 -- Continued
CLASSIFICATION OF MANAGEMENT MEASURES

STUDY	ALT MANAGEMENT MEASURES	EQ MANAGEMENT MEASURE	REMARKS
	(Line Creek)		
	Regulatory Measures	Yes	
	Acquisition for Parks	Yes	
	Channel Maintenance	No	
	Channel Modification	No	
	Bridge Modification	No	
	Detention Structures	No	
	(Newman Bottoms)		
	Regulatory Measures	Yes	
	New Levee	No	
	(Rock Creek and Hillside Ditch)		
	Regulatory Measures	Yes	
	Detention Structures	No	
	Channel Maintenance	No	
	Channel Modification	No	
	Bridge Modification	No	
	Modification to Existing Structures	No	
	(Courtney Bottoms)		
	Regulatory Measures	Yes	
	New Levee	No	
	(Kansas River Area)		
	Regulatory Measures	Yes	
	Acquisition for Parks	No	
	Floodproofing	No	
	Levees	No	
LAKE PONTCHARTRAIN	(Lower Tchefuncte River Area)		
	Revetment works	Yes	Flood protection provided by concurrent authorized project; economically unjustified for erosion control only
	Seawall	Yes	Responsibility of the City of Madisonville
	Levee with riprap	Yes	
	National Flood Insurance Program	No	
	(Mandeville Area)		
	Restoration of existing seawall	Yes	To be provided by concurrent authorized project
	Replacement and extension of seawall	Yes	Economically unjustified due to authorized improvements
	Construction of sand beach in front of seawall	Yes	Opposed by local interests
	Hurricane protection levee	No	Economically unjustified due to authorized project
	National Flood Insurance Program	No	Responsibility of the City of Mandeville
	(Howze Beach Area)		
	Improve and enlarge levee	No	No local support
	Restore and maintain pumping stations	No	No local support

Table B-2 -- Continued
CLASSIFICATION OF MANAGEMENT MEASURES

STUDY	ALT MANAGEMENT MEASURES	EQ MANAGEMENT MEASURE	REMARKS
	(Slidell Area)		
	50-year storm levee	No	Economically unjustified
	100-year storm levee	No	Economically unjustified
	Standard project hurricane levee	No	Economically unjustified
	National Flood Insurance Program	No	Responsibility of the City of Slidell
	(Apple Pie Ridge Area)		
	Ring levee	No	Economically unjustified
	Improve highway embankment to act as levee	No	To be provided by concurrent authorized project
	(Bayou Castine Area)		
	Federal assumption of maintenance-hydraulic dredging	No	NED-EQ Plan
	Federal assumption of maintenance-bucket dredging	No	Environmentally unacceptable due to turbidity
	Placement of dredge material in diked areas	No	Environmentally unacceptable due to commitment of sites
	Placement of dredge material at Fontainebleau State Park	Yes	NED-EQ Plan
	(Fontainebleau State Park Area)		
	Revetment works	Yes	Economically unjustified
	Seawall	Yes	Economically unjustified
	Beach revegetation	Yes	Contrary to local interests
	Riprap along entire shoreline	Yes	Economically unjustified
	100-foot wide nonrecreational beach with construction and nourishment material from local sand pits	Yes	Contrary to local interests and economically unjustified
	100-foot wide nonrecreational beach with construction and nourishment material from dredging	Yes	Contrary to local interests and economically unjustified
	250-foot wide recreational beach with construction and nourishment material from local sand pits	Yes	EQ Plan
	250-foot wide recreational beach with construction and nourishment material from dredging	Yes	NED Plan

Table B-2 Continued

CLASSIFICATION OF MANAGEMENT MEASURES

STUDY	ALL MANAGEMENT MEASURES	EQ MANAGEMENT MEASURE	REMARKS
LUCKY PEAK	Reduce power demand	No	Considered to be beyond the scope of the report
	Unconventional power sources (solar, wind, geothermal)	No	Limited output and technology not advanced
	Fossil fueled thermal generation plant	No	Opposed by local interests
	Nuclear fueled thermal generation plant	No	Indicated as being a likely alternative and used for cost comparison--actual construction beyond the scope of the report
	Hydropower production at Lucky Peak but constructed and operated by a non-Federal interest	No	This measure was briefly identified in the EIS as a viable alternative but it was also stated that no extensive investigations were made concerning this alternative
	Hydropower production at Lucky Peak, constructed and operated by the Corps	No	NED EQ plan, EQ because it is LED of the alternatives considered further
	Store water in irrigation canals	Yes	Only limited storage could be obtained
	Store Boise effluent in ponds or inflatable tanks	Yes	Substantially greater cost than additional treatment
	Dam side streams for storage of runoff	Yes	Additional storage would not be sufficient
	Build subimpoundment areas in Lucky Peak	Yes	Very little storage without large investment
	Raise New York Canal Division Dam	Yes	Insufficient storage without large investment and environmental damage
	Land treatment of effluent	Yes	Economically unjustified
	Pump water from wells	Yes	Considered feasible but dropped from consideration with no real reason identified
	Provide necessary treatment at the Boise treatment plant	Yes	Considered feasible but the responsibility of the City of Boise
	Local interests obtain state water rights to uncontracted storage in Lucky Peak	Yes	Storage not sufficient to guarantee flow and against current State policy
	Raise Lucky Peak Dam greater than 12 feet	Yes	Economically unjustified
	Raise Lucky Peak Dam less than 12 feet	Yes	Must be combined with use of uncontracted storage and environmentally unacceptable

Table B-2 -- Continued

CLASSIFICATION OF MANAGEMENT MEASURES

STUDY	ALT MANAGEMENT MEASURES	EQ MANAGEMENT MEASURE	REMARKS
HUDSON RIVER	<u>New Source</u>		
	Reservoirs	Partially	Low-flow regulation, low energy high water quality
	River diversion/storage inter-basin transfer	Partially	Operates during high ("excess") flow periods high energy requirements
	Groundwater	Mostly	Energy demands water quality problems
	<u>Management</u>		
	Conservation		
	Metering	Yes	Conservation has a number of social, economic consequences and varying success.
	Leakage Control	Yes	
	Recycling	Yes	
	Contingency Measures	Partially	
	Education	Yes	
	Conjunctive uses	Yes	Groundwater mining, recharge poor water quality
	Emergency pumping station	Partial	
	<u>Distribution</u>		
	Water treatment plant	Partial	Expensive, energy intensive gravity transportation increase system resiliency; dependability.
	Tunnels	Mostly	
	Interconnections	Mostly	
MOBILE HARBOR	<u>Navigation</u>		
	Deepen, widen main ship channel	----	
	Widen, deepen Theodore Ship Channel	----	
	Provide barge marshaling area	----	
	Provide anchorage area	----	
	Provide turning basin	----	
	<u>Dredged Material Disposal</u>		
	Construct islands for fill adjacent to shore	Partially	
	Open-water disposal (Mobile Bay)	Partial	Dispersion Groundwater contamination potential
	Upland disposal sites	Partial	
	Open-water disposal (Mobile Bay)	Partial	
	Upland disposal sites	Partial	Dispersion Groundwater contamination potential
	Open-water disposal (Mobile Bay)	Partial	
	Recycle material off existing disposal sites	Mostly	Expensive
	Abate shore erosion with dredge material	Mostly	Aesthetic concerns
	<u>Water Quality</u>		
	Remove man-made destruction to Bay circulation	Yes	Restoration, but with change in existing ecosystem
	Full depressions in Bay to reduce anoxia	Partially	
	<u>Fish and Wildlife</u>		
	Improve areas adjacent to causeway	Yes	
	Establish oyster beds	Yes	
	<u>Port Development</u>		
	Offshore terminal	Partial	
	Future expansion area	----	

Indicators To Describe EQ Resource Attributes

Background

Indicators are parametric or descriptive representations of resource attributes. The purpose of abstracting an attribute characteristic or the inherent quality (property) of a resource is to include it in a forecasting and evaluation framework. "The evaluation framework specifies the ways in which changes in significant EQ resources and attributes will be measured or otherwise described. The framework consists of indicators, units, guidelines, and techniques. The framework guides the collection of information about the existing, without-plan, and with-plan conditions of significant EQ resources and attributes" (18 CFR 711.62 (c)).

Indicators are used to describe effects of actions on EQ resources by comparing the changes in indicator quantity or quality for with- and without-plan conditions. Ideally, indicators should be selected to describe effects in terms of duration, frequency, location, magnitude, reversibility, retrievability, etc., so that net effects assessment and tradeoffs can be grounded more firmly. Indicators should be supported by guidelines, criteria, or standards related both to the indicator and to the selected measurement technique.

The current planning regulations (ER 1105-2-220) do not explicitly require developing an evaluation framework which reflects resource attributes. However, there is an implicit link in the requirement to project "basic demographic, economic, environmental and social parameters" as part of alternative futures forecasting. The EQEP emphasizes the development of indicators and requires that the selected indicators be used to forecast "with- and without-project future" conditions. The construction of an evaluation framework, definition of resources, and selection of appropriate indicators are critical to forecasting with- and without-plan futures. This, together with the apparent difficulty of the field planner to deal with forecasting without-plan futures, especially for EQ resources, is expected to be the most difficult part of the planning process, considering the central role that forecasting plays in plan formulation and evaluation.

Findings/Conclusions (Refer to Table B-3)

- o In all but a few studies (Wilmington Harbor, Kansas City Urban Study, Hudson River Project), a basic approach to EQ evaluation is not specified; environmental indicators were developed sparingly or without real purpose.

- o Parameters and variables, which were ultimately used in the bases for analysis and forecasting, were most often related to demographic and economic data which was available. There apparently was no clear view of using existing data as indicators which could be carried through the assessment and evaluation states.

o EQEP requires that those indicators specified to describe resources in the evaluation framework must be the same ones used to forecast future "with" and "without" conditions. This places a substantial burden on planners for proper early selection; it also assumes a great deal of knowledge about cause-effect relations and interactions of future trends on project outputs.

o Only indicators having an adequate data base or knowledge factor should be used. The development of the train of information specifying the resource, and embodied in Tables 1 and 2 of App A from EQEP (18 CFR 714) is a valuable documentation exercise having other benefits (see discussion of the planning process).

Table B-3

DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
FULLY BEACH	Shoreline	Aesthetic	Ocean View	Presence/ Absence	Dunes over about 12 ft block view.	
			Recreational Value	Persons	Beach Capacity = 1 person/100 sq ft.	
				User Occasions	Daily max = 1 person/ 100 sq ft x 2.	
		Cultural		No. Parking Spaces	Easy access = 1/4 mile	
			Land Value	No. building		No. landward of Nhw Shoreline
				Value/ft of front		Value of building divided by frontage ft.
		Ecological	Shoreline Stability	Ft/yr eroded	Critical = 5 ft/yr	Historical photography and maps basis for estimating future shoreline.
FOURCH FAYOU	Fourche Bottoms	Ecological	Unique	Acres	Area now intact	
			Habitat Value	Species	State/Federal lists	Available species information
			Water Value			Recognition of hydraulic character
		Aesthetic	Open space	Acres		
			Educational Value	Acres	Specified minimum county needs	State Outdoor Recreation Plan
			Recreational Value	Facilities		
		Cultural	Production Value	Board ft/acre		
	Archeological	Cultural	Indian Life	Presence/ Absence	Age	Cultural Resources Inventory
			Architectural Value and Event Value	Presence/ Absence	National Register	State Historic Preservation Program
	Urban Open Space	Aesthetic	Recreational Type	Acres of Facility	Arkansas State Recreation Program	State Recreation Program
	Water Quality	Ecological	Coliform bacteria	Populations	State Health Department	
			Metals	Concentrations	Public Health Department	
	Fish and Wildlife	Ecological	Habitat	Acres		
			Water Quality	Level of Urbanization		
			Rare and Endangered Species	Species Name	State/Federal lists	State/Federal lists
	Aesthetics	Aesthetic	Riparian Vegetation	Miles		

Table B-3 -- continued
DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
WILMINGTON HARBOR	Biological Productivity	Ecological	Net Primary Productivity	Grams C/m ² /yr		
	Diversity of Habitat	Ecological	Dependent Birds	No. species/ habitat type		
	Selected wildlife Value	Ecological	Habitat Value for 7-game species	Total Habitat Points		
	Contribution to Estuarine Productivity	Ecological	Energy flow to estuary	H, M, L, or 0		
	Unique Areas	Ecological	Rare Species	No. Species		
	Natural Beauty	Aesthetic	Feeling	Present/Absent	Awe/Inspiration	Perception
	Archeology, History	Cultural	Indian life/ event assoc.	No. sites	Present/Absent	Cultural Resource Survey Records Search, Magnetometer Survey
HOCKING RIVER	Aquatic fauna (fish)	Ecological	Species		Food supply, shelter, spawning needs	Expected occurrences inferred from pub- lished lists
	Vegetation	Ecological	Species	Acres		Visual estimations, public reports
	wildlife	Ecological	Species		Habitat requirements	Expected occurrences inferred from pub- lished lists
	Water Quality	Ecological, Cultural	Various content proportions		State and federal legal standards	Chemical analyses
	Archeological/ Historic sites	Cultural	Potential Identification	Site, structure	Nat'l Register, professional advice (Advisory Council, Ohio S.H.P.O.)	Cultural resources survey (after authorization for construction)
GRAYS HARBOR	Water	Ecological	Hydrology	---	(
			Inflow	c.f.s	(Flushing	
			Tides	ft	(
			Salinity	---	Present life forms requirements	
			Quality measures	various	Wash. Dept of Ecology Water Quality Standards	Conventional measures of coliforms, dissolved oxygen, temp, turbidity, toxics, etc.
	Soils and Sediments	Ecological	Littoral processes (Modeling
			River sources (cubic yards		
			Marine sources (
	Terrestrial and Marine Ecological Functions	Ecological	Food production (Literature describing	
			Habitat (Grays Harbor Estuarine	
			Soil stabilization (System	
			Waste removal (

Table B-3 -- continued
DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
NORFOLK HARBOR	Hampton Roads Vicinity	Cultural	Points of archeological significance	Listing of places	Archeological and Historic Pres Act.	National Register of Historic Sites
	Suffolk Disposal Site	Cultural	Archeological survey		Archeological and Historic Pres. Act.	Conducted by staff of Old Dominion Univ.
	Study Area	Ecological	Forest lands	Acres		
	Study Area	Cultural	Water demand	Millions of gal.		Trend projection.
	James River	Ecological	Tidal influences	Salinity and Chlorinity		
	Dismal Swamp	Ecological	Soils	Types of soils	Soil conservation/soil types	Soil Conservation Service Study
		Ecological	Vegetative communities	Type of vegetation & acreage covered		Fish & Wildlife Service Study
		Ecological	Wildlife habitat	List of wildlife species List of endangered species	Endangered Species Act	Inventory by Fish & Wildlife Service. U.S. Fish & Wildlife Service Study
BAYTOWN	Study Area	Ecological/Aesthetic	Sediment	Listing of characteristics		
	"90 Acre Marsh"	Ecological	Terrestrial habitat	Vegetation	Listing of plant species	
		Ecological	Terrestrial habitat	Wildlife	Listing of birds	
		Ecological	Aquatic habitat	Fisheries	Listing of species	
	Coastal Lands	Ecological	Vegetation	Types of trees		
			Wildlife	Types of birds		
		Cultural	Historical events	Listing of events		
		Cultural	Archeological sites	Inventory of refuse heaps		Texas Archeological Survey Report
		Ecological	Encroachment of bay waters	Acres of land claimed by bay waters		
		Ecological	Oil & water extraction	Gals. withdrawn		U.S. Geological Survey Study
CACHE CREEK	Sedimentation and Erosion	Ecological/Aesthetic	Bank Erosion	Acres	Land planning creek subject to erosion	
		Ecological	Sediment Load in Creek	Tons/sq mi	Comparison with other rivers	Literature search
		Ecological	Sedimentation in Clear Lake	% of annual suspended sediment load		
		Ecological	Sediment Transport	Tons/day		Reference U.S. Geological Survey Study
		Ecological	Sediment Deposition in Settling Basin	Acre/ft		
	Water Quality in Clear Lake	Ecological/Aesthetic	Algal Blooms	Trophic State		
	Fish & Wildlife in Study Area	Ecological	Aquatic Habitats	Habitat/units		U.S. Fish & Wildlife Report

Table B-3 -- continued
DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
	Hydrologic	Ecological	Terrestrial Habitats	Habitat units		U.S. Fish & Wildlife Report
		Ecological	Stream Flow and Volume Data	Ft/sec		
		Ecological	Precipitation Patterns	Normal annual precipitation (ISOHYETS)		
		Ecological	Avg. Annual Runoff	Acre/ft		U.S. Geological Survey Study
		Ecological	Drainage Basin Patterns	# of sub-areas drainage divides		
		Ecological	Unit hydrographs	Time & discharge graphs		Corps Technical Bulletin
		Ecological	Flood Frequency	Peak flows of var time intervals		
		Ecological	Wave runup & wind setup	Ft above normal lake level		Technique discussed in report.
	Cache Creek & Settling Basin	Ecological	Flood plain area	Acres	100-Yr Flood Plain	
		Cultural	Density of archeological sites	# of sites/ac	Archeological & Historical Pres. Act	Archeological Survey.
		Ecological	Elevation of land forms	Ft from sea level	Changes in last 30 years	U.S. Geodetic Survey
	Coastal Lands	Ecological	Frequency of flooding	Dates of occurrence		Corps report
		Ecological	Return frequency of selected water elevations resulting from hurricanes	Ft (height of surge)		Corps report
TAMPA BAY	Fish and Wildlife	Ecological	Aquatic Habitat	No. of Fish Caught/Day	---	Survey by Florida Dept. of Natural Resources
		Ecological	Fauna	List of Species Found	---	Woolfender and Schreiber (1973)
			Flora	List of Species Found	---	"
	Hydrologic	Ecological	Stream Flow and Volume Data	Ft3/Sec	---	---
		Ecological	Water Quality	PPM	Class III Waters	Florida Env. Protection Agency
	Archeologic Sites	Cultural	Archeological Listing/Survey	Presence/Absence	State and Federal Criteria	National Register of Historic Places
	Population Characteristics	Cultural	Population	No. of People by County & Increase over Years	---	Florida, Dept of Commerce

Table B-3 -- continued
DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
KANSAS CITY (KCMR) METRO REGION	Habitat Diversity	Ecological	Trees	Listing: Population Status (Common, Uncommon & Rare)	---	Social and Environ- mental Inventory 1975, KCMR
			Amphibian and Reptiles			
			Fish	Listing: Population Status Undetermined, Rare and Endangered	---	Social and Environ- mental Inventory 1975 KCMR
			Birds	Listing: Population Status Common, Uncommon Rare, Resident, Migrant.	---	Social and Environ- mental Inventory 1975, KCMR
			Mammals	Listing: Population Status Common, Uncommon, Rare	---	Social and Environ- mental Inventory 1975, KCMR
			Fauna	Listing: Endangered or Threatened	---	Social and Environ- mental Inventory 1975, KCMR
	Archeological/ Historic Sites	Cultural	Archeological/ Historic Sites	Map of and Area Number of Archeological Site	---	Social and Environ- mental Inventory. 1975, KCMR
		Cultural	Historic Sites	Lists of Bldg or Site and Location		Social and Environ- mental Inventory 1975, KCMR
	Population Characteristics	Cultural	Population Density	# People/ Sq. Mi.	---	Bureau of the Census, 1970, Census of Population
			Age Characteristic	# People/Age Group/County		Bureau of the Census, Population Estimates and Projections
			Employment	% Employed by each Sector/County		Bureau of the Census, Population Estimates and Projections
LAKE PONTCHARTRAIN	Archeological Sites	Cultural	Archeological Value	No. & Condi- tion	Professional Judgement and National Register of Historic Places Criteria	Contact with Louisiana Archeological Survey & Antiquities Commission and on-the-ground Professional Survey
	Fontainebleau State Park	Cultural	Recreation Use	Visitation Days	Limit of 850,000 Days per Year (SCORP criteria)	Louisiana State Parks & Recreation Commission (LA P&RC) State Compre- hensive Outdoor Recreation Plan (SCORP) Techniques
			Beach Use	Peak Day Visitation	Limit of 16,000 Peak Day Users (SCORP Criteria) and Guidelines EM 1120-2-108	OBERS projection. LA P&RC SCORP Techniques and EM 1120-2-108
			Recreation Area and Facilities	Acres	Existence and Protection per LA P&RC SCORP	Extrapolation of historical trends of shoreline lost

Table B-3 -- continued

DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
		Ecological	National Wetland Acreage	Acres	Preservation and Protection per LA PARC SCORP	Bibliographical and extrapolation of historical trends of shoreline lost
	Historical Sites	Cultural	Historic Value	Number and Condition of Sites	National Register of Historic Places	Contact with State Art, Historical and Preservation Agency
	Lake Pontchartrain Habitat	Ecological	Aquatic Vegetation Abundance	Acres and Density	---	--
			Aquatic Invertebrate Abundance	Number per Square Meter	---	Bibliographical
			Aquatic Vertebrate Abundance	Number and Concentration of Species	---	Bibliographical
	Lake Pontchartrain Sediments	Ecological & Cultural	Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, COD, TKN, TVS	Mg/Kg	EPA Criteria	Records and sampling
			Sediment Grain Size	mm	Percent Fine and Medium Sand	Sample borings
	Lake Pontchartrain Water	Ecological, Cultural & Aesthetic	Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, COD, TKN, TVS	Mg/l	EPA Criteria	Records and sampling
			Turbidity	Jackson Turbidity Units	---	Records and sampling
			Dissolved Oxygen	Mg/l	Louisiana Stream Control Commission (LA SCC)	Records and sampling
			pH	pH Units	LA SCC	Records and sampling
			Fecal Coliform	Colonies per 100 ml	LA SCC	Records and sampling
			Salinity	p.p.m	---	Records and sampling
			Conductivity	Micromhos per cm	---	Records and sampling
			Temperature	OC	---	Records and sampling
			Ammonia, Alkalinity, Nitrates, Arsenic, Aldrin, Dieldrin, Iron, BOD, Chloride	Mg/l	---	Records and sampling
	Lowland Marshes and Swamps	Ecological	Vegetation Species	Number and Types of Species	---	Bibliographical

Table B-3 -- continued
DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
			Wildlife Species	Numbers and Types of Species	---	Bibliographical
	Shoreline	Ecological & Aesthetic	Shoreline	Feet per Year (Acres)	Lost acreage	Extrapolation of historical trends from aerial photographs
	Streams	Ecological & Cultural	Shoaling as Indicated by Depth to Bottom	Feet	---	Historical records and trend projection
			Water Level	Feet Above m.s.l.	---	Gauge readings
LUCKY PEAK	Boise River	Ecological	Flow Velocity for Aquatic Habitat	Cubic Feet per Second (c.f.s.)	U.S. Fish and Wildlife Service (Oregon Method)	Forecast releases from Lucky Peak
		Ecological & Cultural	Flow Velocity for Water Quality	c.f.s.	Greater than 160 c.f.s. (City Request)	Forecast releases from Lucky Peak minus diversion
			Dissolved Oxygen	Mg/l	Greater than 5	Monitoring
			Temperature	OC	---	Monitoring
			Fecal Coliform	---	---	Monitoring
	Historical/ Archeological Sites	Cultural	Historical/ Archeological Value	Number and Condition of Sites	National Register of Historic Places Criteria	Contact with Idaho State Historical Society, and Record of Investigations during Lucky Peak Dam and reservoir construction
	Irrigation Area	Ecological	Flow Velocity	c.f.s.	Amount of contracted storage	Forecast Releases from Lucky Peak
	Lucky Peak Lake	Ecological	Fishery Species and Abundance	Numbers and Types of Species	---	---
			Water Level for Dependable Habitat	Acre/Feet	---	Forecast storage and released from Lucky Peak
		Cultural & Aesthetic	Surface Area of Lake for Lake View	Acres	---	Extrapolation of forecast Lake level on contours
			Height of Water on Arrowrock Dam	Feet	---	Extrapolation of forecast Lake level on contours
			Loss of Recreation Areas Due to Lake Level	Feet Above m.s.l.	Height in Elevation in Relation to Recreation Area Location	Extrapolation of forecast Lake level on contours
	Lucky Peak Dam Site	Aesthetic	View of Spray from Flip Bucket	---	---	---
			View of Dam Site	---	---	---
		Ecological	---	---	---	---
	Recreational Development	Cultural	Visitor Days	Number	---	Contact with Idaho Department of Parks and Recreation
			Numbers and Types of Facilities	Number	Amount Lost or Gained	Extrapolation of forecast Lake level on contours
	Wildlife Area Around the Lake	Ecological	Mule Deer Population per Season	Number	---	---
			Loss of Winter Range	Acres	---	Extrapolation of forecast Lake level on contours

Table B-3 -- continued

DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
HUDSON RIVER	Hudson River Ecosystem Estuary	Ecological	<u>Ten Indicator Species</u>			
			Striped bass (anadromous)	Biomass; fish catch	Numerous previous studies conducted for power plant siting and permit EIS's	2 striped bass life cycle mathematical models
			Shad (anadromous)	per unit effort; density per m ³		
			Spottail shiner (resident fresh)	m ²	EPA, FWS and court litigation guidelines	Life cycle histories
			Bay anchovy (res. estuar.)	\$ value, commercial		
			American eel (catadromous)			
			Cyclops bicuspl. (microzoopl.)			
			Gammarus f. (fresh macrozoo)			
			Neomysis amer. (macrozoo)			
			Chironomus (benthic arth.)			
			Sturgeon (anadromous)			
		Cultural	Striped bass	biomass, \$ value density	Commercial and recreational sports value	(same as above)
	Water Quantity	Ecological	<u>Hydrologic</u>			
			1965 low-flow sequence	cfs, mgd, recurrence	Historical data development, standard hydrologic practices.	Mathematical simulation, water balance/storage travel time computations
			1969 avg.-flow sequence			
			1973 high-flow sequence		Standard hydraulic, oceanographic practices	Hydrologic, hydraulic, transport models for Hudson River Estuary and New York Bay.
			Other flow frequency parameters			
			<u>Hydraulic</u>			
			tidal volumes	cfs, mi ² , ppm		
			cross-section flow velocity			
			assimilative capacity			
			entrainment			
			diffusion, dispersion			
		Aesthetic	flow volume peak flows low flows salt front position	cfs, mgd	Flows needed for municipal industrial waste assimilation, community water supply withdrawals; recreational aspects and visual quality	Waste assimilation studies coupled with stream quality standards.
	Water Quality	Ecological	10 indicator aquatic species	Temp, salinity, D.O., flow	Life cycle water quality requirements	Comparative analysis, thresholds
			Salinity, Chlorinity (saltfront excursion)	ppm, ppt milepoint		
			Temperature	OC, OF	(Same as above)	Water quality math model, numerical W.Q. index graphical analysis (Same as above)
			BOD, DO	ppm, ppt	Health standards (EPA, NY State)	Comparative analysis data base (STORET) vs. standards.
			Organic wastes load, Coliforms	lbs BOD, pop. equivalents		
			Inorganics (PCB, Pesticides)	ppm	Health standards (Same as above)	(Same as above)
			Radionuclides	ppb		
			Sediments		Concentration standards	Comparative analysis of existing data
			suspended bed	ppm, tons		
					Species life cycle requirement, constraints	Secchi disk Readings
		Aesthetic	Turbidity Coliforms	Jackson units, light penetration	NY State WQ standards for swimmable waters	

Table B-3 -- continued
DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
	<u>Terrestrial Sites</u>					
	TOP:					
	Treatment plant Pumping station Rubble disposal Tunnel shafts					
	(a) Terrestrial Habitat	Ecological	Forest	Habitat type Acres	Land use designations, Historic use patterns	Plant/species association, site visits, qualitative appraisal literature
			Inactive farmland	Acres		
			Wetland	Acres		
			Shoreline	Files	Erosion loss criteria	
			Soils	Soil type		
		Aesthetic	Land use diversity	Land use	New York State Scenic & Recreational guide- lines, zoning, land use designation.	Site visits; association with guidelines, public input
			Topographic relief	Diversity		
			Visual panorama	Classification		
		Cultural	State historic districts; sites paleontological sites	site specific	Registers of historic, archeological, scientific sites	Coordination with state historic offices; public workshops Site visits
	(b) Air	Ecological	Air quality parameters particulates sulphur dioxide carbon monoxide	ppm	EPA standards days exceeding threshold	Comparative analysis of data
		Aesthetic	(Same as above) Noise	db	Standards	Develop noise thresholds for each site; for construction equipment compare with standards; pop. density, etc. future "without project" forecasts during a drought scenario
	Urban Land- scape (New York City)	Aesthetic	Water supply deficit	mgd	Water needed for basic city functions; lawn watering, public parks; street cleaning; firefighting; recreation	
		Cultural	Water supply deficit	mgd	Comparable drought emergency condition in previous epochs -- no water in resources, diminishment of cultural/recreational activities	Future "without project" forecasts during a drought scenario
	Groundwater	Ecological	Volume quality	mgd hardness	Depletion of shallow aquifers, recharge during drought	Groundwater models of Long Island aquifers
			TDS	"ruining" of deep aquifers	saltwater intrusion, contamination	

Table B-3 -- continued
DEVELOPMENT OF EQ EVALUATION FRAMEWORK

STUDY	RESOURCE	ATTRIBUTE	INDICATOR	UNIT	GUIDELINES	TECHNIQUES
MOBILE HARBOR	<u>Mobile Bay</u>					
	(a) <u>Estuarine Ecosystem</u>	Ecological	Oyster Beds reefs Fishery, Shellfish	Acre, living oyster reefs lbs. land & value	Anticipated adverse impact Anticipated adverse impacts	Literature, Alabama, Geological survey Data, literature
	(b) <u>Estuarine benthos</u>	Ecological	Benthic habitat	Acres	Anticipated adverse impacts	Sediment samples, elutriate tests, bioassays
	(c) <u>Water quality</u>	Ecological	Salinity surface current	Parts per thousand velocity	Saltfront intrusion, salinity gradient two layer flow	Physical hydraulic model tests, dye tests.
		Aesthetic	Health, safety	Coliforms toxics	Alabama water quality classification, EPA 208 studies	Existing guidelines assumed to be full-filled--no data analysis
	(d) <u>Wetlands</u>	Ecological	Floodplain forest; Mobile River delta; freshwater marsh; brackish marsh; saltmarsh	Asst. plant spec.	No guidelines set for values or comparative analysis	Inventory of state of Alabama marshes using ERTS Satellite photos. No breakdown of Mobile Bay marshes
	(e) <u>Shoreline</u>	Aesthetic	Erosion	Rate of Erosion	Erosion abatement plan object	None offered, assumed knowledge of problem
	(f) <u>Shipwrecks, Forts, Lighthouses</u>	Cultural/ Aesthetic	Type of cultural resource classes	Number of resource	National Register (forts, ships)	Shipwrecks and light-houses on Navigation charts. Detailed cultural reconnaissance proposed for GDM.
	<u>Barrier Islands</u>					
	<u>Barrier Islands</u>	Ecological				
	<u>Dauphin Island</u>	Aesthetic	Beach Erosion	Erosion Rate	Existing condition	Assumed knowledge of problem
	<u>Gulf of Mexico</u>					
	(a) <u>Water Column</u>	Ecological	Water Quality	Turbidity	Anticipated effort of disposal	None offered; results of DMRP studies forthcoming
	(b) <u>Benthos</u>	Ecological	Sediments; benthic species	Settling rates; chemical interaction; species mortality.	Scientific literature DMRP	Elutriate tests; bioassays; biotoxicity

Techniques To Measure EQ Resource Impacts

Background

Like indicators, measurement techniques are important to forecasting -- the focus of the P&S planning process. Ideally, indicators should be selected according to several pragmatic criteria; the most important criterion is that the indicator can be measured and forecast with reasonable acceptability (Figure B-1). Indicators may also be used for the very important forecasting evaluation tests of risk and uncertainty. The EQEP (18 CFR 714.422) states that "general forecasting approaches that may be considered are:

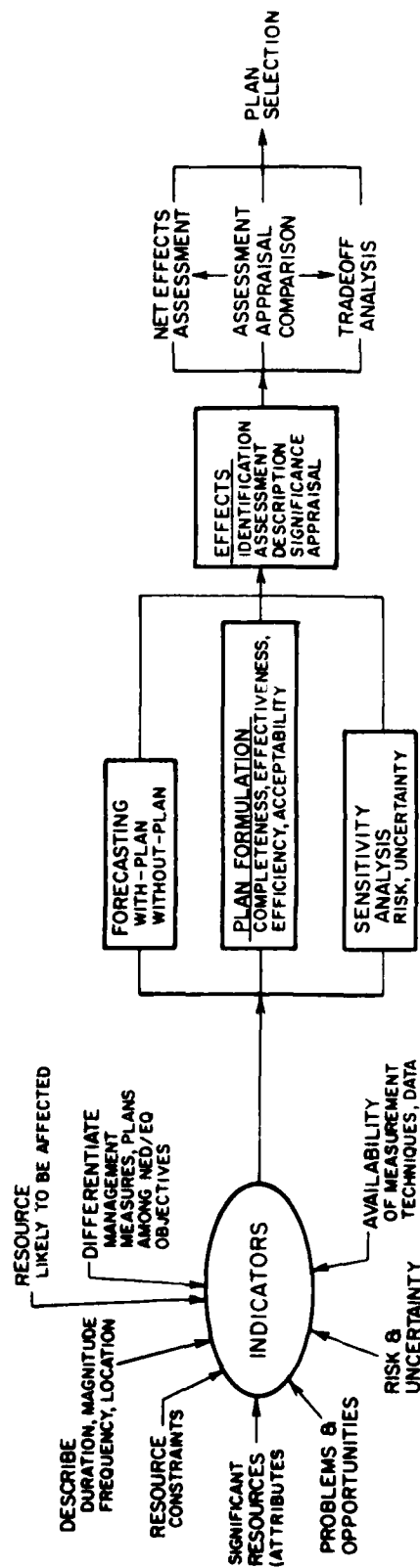
1. Adoption of available forecasts developed by other sources.
2. Use of scenarios to estimate hypothetical futures and the likely sequences of events that might lead to those futures.
3. Use of expert group judgment approaches, such as Delphi and nominal group, in which views of relevant professionals about future conditions are systematically elicited and analyzed.
4. Use of extrapolation approaches, such as trend analysis and simple modeling, which rely on historic trend information to estimate the future.
5. Use of analogy and comparative analyses, in which the effects of actions similar to those expected in the without-plans condition, on the specified indicators, in similar environmental settings are used to estimate future conditions."

Paragraph 714.422(e) states that ultimately and rationally, "forecasting approaches should be compatible with the measurement and description techniques specified in the evaluation framework." Therefore, the implication is that measurement techniques should not only describe an attribute's quantity and quality characteristics (duration, frequency, location, magnitude, reversibility, etc.), but that there must be a continuity and rationale imposed on the entire stream of actions starting with the selection of an indicator, and progressing through measurement, forecasting, effects appraisal, and tradeoffs analysis.

The existing Corps planning regulations (ER 1105-2-240) require that impacts be measured, i.e., describing the magnitude, location, timing, and duration of each significant impact. Again, the regulations do not specify analytical quantification, but rather only quantification to the extent that the impacts are compared to "projected parameters" in the "without project" cases. The EQEP also seems to imply an empirical treatment of existing information rather than a deterministic, predictive forecasting approach. Based on a review of the studies, the difficulty imposed on the field by an early development of a total evaluation framework is considerable. However, several of the case studies reviewed have shown that this type of analysis can be conducted more rigorously, and ultimately produce a more rational, traceable, and lasting decision.

Findings/Conclusions (Refer to Table B-4)

- o In most studies, specific EQ measurement techniques were applied sporadically or spuriously; that is, the measurement had no material bearing on a decision, but instead simply reflected the availability of data.
- o EQ measurement techniques were not systematically tied to a consistent evaluative framework linking resources to impacts.
- o EQ measurement techniques which were more fully developed were generally applied in the EIS phase, thereby diluting their utility in the early stages of plan formulation.
- o Most feasibility studies deferred detailed environmental analyses to the Phase I, GDM studies, considering them to be the implied appropriate level of inquiry.
- o The baseline with/without projections is considered in many of the studies, but not adequately developed; furthermore, its potential is not fully realized.
- o The EQEP provides ample, but relatively abstract, guidance on the nature of forecasting and the level of quantification. EQEP implies a distinction among the various empirically based forecasting techniques for survey scope studies (Level C); it also possibly implies more quantitative, predictive, numerical modeling and physical hydraulic models which may be appropriate for Phase I, GDM studies.



EVALUATION FRAMEWORK

Figure B-1

Table B-4

EVALUATION OF RESOURCE MEASUREMENT/DESCRIPTION TECHNIQUES

STUDY	INDICATOR	TECHNIQUE IDENTIFIED	EVALUATION OF USE								REMARKS on TECHNIQUES			
			OVERLY SIMPLE (S) OR COMPLEX (C) NO S C			APPLIED CORRECTLY YES NO		APPROPRIATE (VALID) YES NO		AFFECT DECISION YES NO		TIMELY YES NO		
FELLY LEACH	Ocean View	None												
	Recreation Value	None												
	Land Value	No. buildings land-ward of MHW shoreline	X			X		X		X		X		
	Shoreline Stability	Value of buildings frontage, feet Historical photography and maps basis for estimating future shoreline.	X			X		X		X		X		
FLORIDA BAYOU	Uniqueness	None												
	Habitat Value	Available species information	X			X		X		X		X		
	Water Value	Recognition of hydraulic character	X			X		X		X		X		
	Open Space													
	Education Value	State Outdoor Recreation Plan	X			X		X		X (weak)		X		
	Recreation Value	None												
	Production Value	Cultural Resources Inventory			X			X		X		X		
	Indian Life	Site Historic Preservation Program	X			X		X		X		X		
	Architectural													
	Value & Extent Value													
	Recreation Type	State Recreation Program	X			X		X		X (weak)		X		
	Poliform Pacteria	None												
Metals	None													
Habitat	None													
Water Quality	None													
Rare and	State and Federal Lists	X			X		X		X		X			
Endangered Species														
Riparian Vegetation	None													
WILMINGTON HARBOR	Net Primary Prod	None												Technique not adequately described or referenced to convey how was applied
	Dependent Birds	None												
	Habitat Value,	None												
	Game Species	None												
Energy flow to														
Estuary														
Rare Species	None													
Feeling	Perception			X		X		X		X		X		Overly dramatized.
Indian life/event association	Cultural Resource Survey, Records Survey, Magnetometer Survey	X			X		X		X		X			
HOEKING RIVER	Archeological/	Cultural Resources Survey (use deferred to Phase I GDM)												
	Historic Sites	Review of Ohio Arch. & Hist. Literature		X		X		X		X		X		Technique of assessment indicated no. of likely sites; if sites were encountered, decision would be made as to action warranted.
	Wildlife	Use of published species lists to determine "expected occurrence"		X		X		X		X		X		
species														
Water Quality	USGS Water Quality Records		X		X		X		X		X			Indicated that water quality was poor and implied little latitude for further degradation during construction, especially from fishery standpoint.
parameters														

Table B-4 -- continued
EVALUATION OF RESOURCE MEASUREMENT/DESCRIPTION TECHNIQUES

STUDY	INDICATOR	TECHNIQUE IDENTIFIED	EVALUATION OF USE								REMARKS ON TECHNIQUES
			OVERLY SIMPLE (S) OR COMPLEX (C) NO S C	APPLIED CORRECTLY YES NO	APPROPRIATE (VALID) YES NO	AFFECT DECISION YES NO	TIMELY YES NO				
GRAYS HARBOR	Wildlife species	Washington Environmental Atlas Species Lists	X		X		X		X		Lists should have focused fieldwork rather than substituted for investigation.
		U.S. Fish and Wildlife Endangered Species List	X		X		X		X		Not clear what effect continued presence would have on dredging or disposal work.
CACHE CREEK	Bank Erosion Sediment Load in Creek	Comparison with other rivers in literature search	X		X		X		X		
	Sediment Load in Lake										
	Sediment Deposit in Settling Basin										
	Algal Blooms										
	Aquatic Habitat	Habitat Evaluation Procedures	X		X		X		X		Not well described in study.
	Terrestrial Habitat	Habitat Evaluation Procedures	X		X		X		X		Not well described in study.
	Stream Flow & Volume Data										
	Precipitation Patterns										
	Avg. Annual Runoff										Obtained from USGS Study.
	Drainage Basin Patterns										Presumably done by Corps personnel.
	Unit Hydrographs	Visual Graph	X		X		X		X		Source for technique found in Technical Bulletin
	Flood Frequency										
	Wave Run-up; Wind Setup	Discussed in Report	X		X		X		X		
NORFOLK HARBOR	Flood Plain Area										
	Archeological Sites	Archeological Survey	X		X		X		X		Number of sites/ac; density of sites.
	Historical Sites	National Register	X		X		X		X		Of no value to study.
	Archeological Survey	Archeological Survey	X		X		X		X		Conducted by Old Dominion Univ.
	Forestlands										Of no apparent value to study.

Table B-4 -- continued
EVALUATION OF RESOURCE MEASUREMENT/DESCRIPTION TECHNIQUES

STUDY	INDICATOR	TECHNIQUE IDENTIFIED	EVALUATION OF USE								REMARKS ON TECHNIQUE			
			OVERLY SIMPLE (S) OR COMPLEX (C)			APPLIED CORRECTLY		APPROPRIATE (VALID)		AFFECT DECISION		TIMELY		
			NO	S	C	YES	NO	YES	NO	YES	NO	YES	NO	
	Water Demand													Of no apparent value to study.
	Tidal Influences													
	Soils of Dismal Swamp	SCS Study			X		X		X		X	X		Inventory not appropriate for study.
	Vegetative Communities	Fish and Wildlife Study			X		X		X		X	X		Inventory not appropriate for study.
	Wildlife Habitat	Fish and Wildlife Study			X		X		X		X	X		Inventory not appropriate for study.
BAYSTOWN	Sediment													
	Terrestrial Habitat													
	Aquatic Habitat													
	Vegetation													
	Wildlife													
	Historical Events													
	Archeological Sites	Texas Archeological Survey			X		X		X		X	X		Inventory of Refuge Sites
	Encroachment of Bay Waters on Coastal Lands													
	Oil and Water Extraction													Study done by U.S. Geological Survey.
	Elevation of Land Forms													
	Frequency of Flooding													
	Return Frequency of Flood Waters													
TAMPA BAY	Aquatic Habitat	Survey			X		X		X		X	X		Overall techniques were not referenced, or when referenced were not discussed in any detail.
	Fauna	Survey			X		X		X		X	X		
	Flora	Survey			X		X		X		X	X		
	Stream Flow & Volume	None			X		X		X		X	X		
	Water Quality	State Water Quality Standards			X		X		X		X	X		
	Population	Census			X		X		X		X	X		
KANSAS CITY	Geologic Events	Social & Environmental Inventory 1975			X		X		X		X	X		A better insight into the inventory was gained through the use of several footnotes per listing.
	Groundwater Resources	"			X				X		X	X		
	Trees	"			X		X		X		X	X		
	Amphibians & Reptiles	"			X		X		X		X	X		
	Fish	"			X		X		X		X	X		
	Birds	"			X		X		X		X	X		
	Mammals	"			X		X		X		X	X		
	Fauna	"			X		X		X		X	X		
	Archeologic/Historic Sites	"			X		X		X		X	X		
LAKE PONTCHARTRAIN	Archeological Value	Correspondence and on-the-ground survey			X		X		X		X	X		
	Recreation Use	Mathematical calculation based on LA P&RC SCORP, OBERS projection and EM 1120-2-108			X		X		X		X	X		

Table B-4 -- continued

EVALUATION OF RESOURCE MEASUREMENT/DESCRIPTION TECHNIQUES											
STUDY	INDICATOR	TECHNIQUE IDENTIFIED	EVALUATION OF USE								REMARKS ON TECHNIQUES
			OVERLY SIMPLE (S) OR COMPLEX (C) NO S C	APPLIED CORRECTLY YES NO	APPROPRIATE (VALID) YES NO	AFFECT DECISION YES NO	TIMELY YES NO				
	Beach Use	Mathematical calculation based on LA P&RC SCORP, OBERS projection, and EM 1120-2-108	X	X	X	X					
	Recreation Area and Facilities	Extrapolation of historical trends of shoreline lost using maps and aerial photos	X	X	X	X					
	Natural Wetland Acreage	Extrapolation of historical trends of shoreline lost using maps and aerial photos	X	X	X	X					
	Historic Value	Correspondence with state agency	X	X		X	X			No Real Details Provided.	
	Aquatic Vegetation Abundance	None								Bibliographical material was used.	
	Aquatic Invertebrate Abundance	Identified in literature	X		X		X		X		
	Aquatic Vertebrate Abundance	None								Literature citations were provided.	
	Cadium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, COD, TKN, TVS	Records and sampling	X	X	X					A lot of material was presented but its use in the decision was not clear.	
	Sediment Grain Size	Sample borings	X	X	X	X					
	Turbidity	Records and sampling	X		X					Not discussed in detail.	
	Dissolved Oxygen	Records and sampling	X		X					Not discussed in detail.	
	pH	Records and sampling	X							Not discussed in detail.	
	Fecal Coliform	Records and sampling	X		X		X			Not discussed in detail and its use in the decision was not clear.	
	Salinity	Records and Sampling	X		X	X				Not discussed in enough detail.	
	Conductivity	Records and sampling								Not discussed in enough detail.	
	Temperature	Records and sampling	X							Not discussed in enough detail.	
	Ammonia, Alkalinity, Nitrates, Arsenic, Aldrin, Dieldrin, Iron, BOD, Chloride	Records and sampling		X						Much information was provided but its use in the decision was not clear.	
	Vegetation Species	Identified from literature	X		X	X		X			
	Wildlife Species	Identified from literature	X		X	X		X			
	Shoreline Erosion	Extrapolation of historical trends from aerial photos	X	X	X	X					
	Shoaling as Indicated by Depth to Bottom	Historical records and trend projections	X	X	X	X				Records used were not clearly identified.	

Table B-4 -- continued
EVALUATION OF RESOURCE MEASUREMENT/DESCRIPTION TECHNIQUES

STUDY	INDICATOR	TECHNIQUE IDENTIFIED	EVALUATION OF USE								REMARKS ON TECHNIQUES
			OVERLY SIMPLE (S) OR COMPLEX (C) NO S C	APPLIED CORRECTLY YES NO	APPROPRIATE (VALID) YES NO	AFFECT DECISION YES NO	TIMELY YES NO				
	Water Level	Gauge readings	X	X	X			X		Their value to final decision was not clear. However, the information was used in stage 1 and / measure elimination.	
LUCKY PEAK	Flow Velocity for Aquatic Habitat	Forecast of releases from Lucky Peak		X	X		X		X	The discussion of forecasting was confusing; therefore, no indication of whether or not it was applied correctly.	
	Flow Velocity for Water Quality	Forecast of releases from Lucky Peak		X	X		X		X	The discussion of forecasting and downstream water use was confusing; therefore, no conclusion on the correctness of application.	
	Dissolved Oxygen	Monitoring	X		X	X		X	X		
	Temperature	Monitoring		X	X	X		X	X		
	Fecal Coliform	Monitoring	X		X	X		X	X		
	Historical Archeological Sites	Correspondence with Idaho State Historical Society and record of investigations from dam construction	X	X		X		X	X	Technique of old investigations and discussion of their use was very vague.	
	Flow Velocity	Forecast of releases from Lucky Peak		X	X	X		X	X	The use of this information in the decision was not clear.	
	Fishery Species and Abundance	None								Lists of species discussed but no identification of technique.	
	Water Level for Dependable Habitat	Forecast of storage and releases from Lucky Peak	X		X	X		X	X		
	Surface Area of Lake for Lake View	Extrapolation of forecast Lake level on contours	X			X		X	X	Discussed in brief, but not applied.	
	Height of Water on Arrowrock Dam	Extrapolation of forecast, lake level on contours	X		X	X		X	X		
	Loss of Recreation Areas Due to Lake Level	Extrapolation of forecast, lake level on contours	X		X	X		X	X		
	View of Spray From Flip Bucket	None								Mentioned, but no details given.	
	View of Dam Site	None								"	
Visitor Days	Contact with Idaho Dept. of Parks and Recreation	X		X	X		X	X	Mentioned, but its use in the decision was not made clear.		
Numbers and Types of Recreational Facilities	Amount affected based on extrapolation of forecast Lake level on contours	X		X	X		X	X			
Mule Deer Population per Season	None										

Table B-4 -- continued
EVALUATION OF RESOURCE MEASUREMENT/DESCRIPTION TECHNIQUES

STUDY	INDICATOR	TECHNIQUE IDENTIFIED	EVALUATION OF USE								REMARKS ON TECHNIQUES		
			OVERLY SIMPLE (S) OR COMPLEX (C) NO S C	APPLIED CORRECTLY YES NO		APPROPRIATE (VALID) YES NO		AFFECT DECISION YES NO		TIMELY YES NO			
	Loss of Winter Range	Extrapolation of forecast of Lake level on contours	X		X			X	X			X	Considered Significant but no technique to evaluate true impact was identified. There should have been more discussion of winter range as a resource and potential effects on it.
HUDSON RIVER	Ten aquatic indicator special (see Table 3)	Complete life cycle histories with physical, biological, chemical requirements	X		X		X		X			X	Indicator species represent complexity of estuarine ecosystem and interactions
	Striped Bass	Comparison of two developed life cycle math models with applied results		X	X		X		X			X	Models helpful in quantifying entrainment impacts.
	Hydrology	Hudson River basin systems Hydrologic, storage, flow release model		X	X		X		X			X	Aided the proper selection of flow criteria for alternative plan objectives.
	Hydraulics	Existing reports survey on studies and model results for analysis of hydraulic characteristics	X		X		X		X			X	Large numbers of technical studies conducted for power plants.
	Land Use (sites)	Projections for "with", "without" extrapolated from NY State land use projections, statistics	X		X		X		X			X	Empirical analysis
	Noise	Standard noise formula applied to anticipated construction machinery.	X		X		X						Empirical analysis
	Urban Landscape	Socio-economic indicators representing emergency drought conditions in urban environment	X		X		X						Numerous studies consolidated for scenario building
	Groundwater	Comparative analysis of numerous reports on groundwater capacity in Long Island aquifers	X		X		X			-----			
Water Quality	Comparative empirical, graphical analysis. Model results Numerous indicators, parameters	X		X		X						Existing water quality model (NYS) salinity, DO	
MOBILE HARBOR	Fisheries, shellfish	lbs. landings, \$ value	X		X	X			X			X	Not well developed or documented
	Benthos	Sediment samples, elutriate tests, bioassays	X		X		X		X			X	Tests and results not fully integrated to ecosystem impacts.
	Salinity	Hydraulic model		X	X		X		X			X	Effect of channels, freshwater flows on salinity intrusion.
	Cultural resource type	National register historic sites, navigation charts		X		X		X		X		X	
	Beach erosion	Erosion studies	X		X		X		X			X	Not developed, poorly documented.
	Water Quality	Literature analysis; of open water dredging, disposal techniques on turbidity	X		X		X		X			X	

Documentation Required and Suggested by P&S/EQEP

Background

The P&S explicitly address displays (18 CFR 711.70) and their format and content (18 CFR 711.71). "Displays are graphs, tables, drawings, photographs, summary statements, and other graphics in a format that facilitates the analysis and comparison of alternative plans. Concise, understandable displays are needed during the planning process and to provide documentation in compliance with NEPA." Displays are required, but their format is not specified, for the following areas:

1. Existing and forecasted resource conditions related to problems and opportunities within the planning setting.
2. Candidate plans.
 - a. Measures.
 - b. Effects in NED, EQ, RED, and OSE accounts.
 - c. Recommended plan (format specified in 18 CFR 711.71(c)(1)).

The EQEP addresses documentation of EQ evaluation under a discussion of "Performance Objectives" (18 CFR 714.340). EQ evaluation and its documentation are to be:

- a. Understandable to the public.
- b. Accessible to the public.
- c. Traceable analytical and decision processes.
- d. Focus on analysis of significant issues.
- e. Analytic rather than encyclopedic.
- f. Comparable level of detail to NED analysis.
- g. Scientifically valid.
- h. Objective.
- i. Complete and timely.

In reality, the "200 series" planning regulations explicitly require only one display table -- the P&S System of Accounts. However, the regulation pertaining to organization and content of feasibility reports (ER 1105-2-920) specifies that the main report should be brief, implying that tabular and graphical material be used to synthesize a great deal of information. Report appendices are required to "contain detailed and technical descriptions," consisting of "data, charts, tables, and exhibits for existing conditions, alternative future conditions, without project conditions, and problems and needs."

The appendix on formulation, assessment, and evaluation of detailed plans should contain the information necessary to support the decision process and trade-off analysis consisting of "detailed analytical material related to impact assessment and evaluation (impact trees, matrix analyses, sensitivity analysis, etc.)."

The explicit requirements in ER 1105-2-920 match the general EQEP requirements, with the exception that the EQEP provides a useful series of developed, sequential display tables which supplement the documentation requirements of a compatible evaluation framework. The EQEP tables are presented only as samples and are not required. However, EQEP adds one more table which is explicitly required in addition to the three required by the P&S. This table (18 CFR 714.442, Table 714.441) documents the assessment and judgment process involved in determining the net EQ effect of each alternative plan.

Findings/Conclusions (Refer to Table B-5)

- o The general requirements of current Corps guidance match the more explicitly stated EQEP requirements, with the exception that EQEP provides a sample series of developed, potentially helpful display tables.

- o Display of EQ information in the reports analyzed is not treated at a level of detail comparable to economic and technical analysis. Furthermore, the basis of decisions was not generally apparent or obvious to the reviewer.

- o Most deficiencies of the reviewed reports centered on a failure to document or explain decisions or assumptions and to synthesize the culmination of plan formulation or impact assessment into clear, concise informative displays or tabulations.

- o Plan evolution and decision traceability was severely hampered by failure to adhere to even the outline for the main report presented by ER 1105-2-920.

- o Project reports often do not even adhere to the minimal requirements and structure of impact evaluation categories of Section 122 in constructing displays.

- o The use of graphics (tabular, thematic maps, pictorial, etc.) will provide a generally understandable and traceable document to the reviewer and the interested public.

- o Graphic characterization of the steps and decision points in the planning process would lead to greater/enhanced traceability to EQ evaluation.

- o The EQEP information display tables are good models for systematic, sequential displays.

- o Information display tables should be coordinated to provide a consistent hierarchy of information which ultimately can be traced to the System of Accounts, especially the EQ Account.

Table B-5

DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP Requirements*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
FULLY HEALTH	Identify Resources			X		Decisions as to appropriate account for resource evaluation not included.	None
	Develop Framework for Evaluation			X		Reference to or description of some techniques not clear. Biota evaluation not well enough developed to fit framework.	
	Specify Past Trends and Existing Conditions for Indicators			X		Historical values for cultural and aesthetic attributes not developed.	
	Forecast Without-Plan Futures for Indicators			X		All indicators not projected over life of project. Some projections fairly general.	
	Forecast With-Plan Futures for Indicators			X		All indicators not projected over life of project. Some projections fairly general.	
	Identify Effects (w-w/o diff) on Indicators (yes-no)		X				
	Describe Effects on Indicators			X		Generalized; judgement expressions not documented or displayed, particularly for effect magnitude and duration.	
	Determine Significance of Effects on Indicators			X		Not explicitly stated, not well documented.	
	Appraise (beneficial-adverse) Effects on Indicators		X				
	Appraise (describe) Effects on Attributes		X				
FOURCME BAY/UC	Identify Resources			X		No discussion of appropriate evaluation account. Considerations of significance and likely effects not fully developed.	
	Develop Framework for Evaluation			X		Guidelines and techniques not evident for all indicators.	
	Specify Past Trends and Existing Conditions for Indicators			X		Historical information lacking.	Considerable information on socio-economic characteristics presented but of no apparent use. Could have been useful in developing future scenarios but was not.
	Forecast Without-Plan Futures for Indicators		X			Assumptions for future without not clear. Indicators inconsistently projected or not at all.	
	Forecast With-Plan Futures for Indicators		X				Extensive amount of data on resources under existing conditions that was either not referred to or of no apparent relevance to study.
	Identify Effects (w-w/o diff) X on Indicators (yes-no)						
	Describe Effects on Indicators		X			Effects duration and location very generalized.	
	Determine Significance of Effects on Indicators			X			

* Parallels Table found in case histories which indicate report compliance to EQEP.

Table B-5 -- continued
DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP REQUIREMENTS*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
	Appraise (beneficial-adverse) Effects on Indicators	X					
	Appraise (describe) Effects on Attributes			X		Effects superficially treated.	
WILMINGTON HARBOR	Identify Resources			X		Decisions as to appropriate account for resource evaluation not included.	None
	Develop Framework for Evaluation			X		Guidelines and techniques for each indicator not clearly given.	
	Specify Past Trends and Existing Conditions for Indicators			X		Historical conditions verbally expressed.	
	Forecast Without-Plan Futures for Indicators			X		Forecasting techniques not specified; scenarios developed but procedure for value derivation not given.	
	Forecast With-Plan Futures for Indicators			X		Forecasting techniques not specified; procedures for resource value derivation not given.	
	Identify Effects (w/o diff) on Indicators (yes-no)			X		Calculated as percent of without condition that the with would attain (w/o x 100) over the entire projection period.	
	Describe Effects on Indicators			X		Duration and location generalized.	
	Determine Significance of Effects on Indicators				X		
	Appraise (beneficial-adverse) Effects on Indicators			X		Rationale not completely developed.	
	Appraise (describe) Effects on Attributes				X		
HUCKING RIVER	Identify Resources			X		Defacto scoping by process of coordination with natural resource agencies.	Exhaustive "expected occurrence" species lists for state of Ohio Ohio Water Quality Standards.
	Develop Framework for Evaluation	X				Nothing approximating the conceptual system for EQEP was developed, nor seemed to function implicitly in the process of evaluation.	
	Specify Past Trends and Existing Conditions for Indicators			X		Some narrative on history of degradation of River due to industrial encroachment, from drainage. Some annual data on water quality. Dated curves for most phenomena.	
	Forecast Without-Plan Futures for Indicators		X			Forecast largely consists of prediction that zoning (presumably in compliance with FCA) will result in return of floodplain to green space.	
	Forecast With-Plan Futures for Indicators			X		Impacts on a selected set of "specific parameters" are quantified: disturbance, by acres of stream, length of stream, acres of land. These are forecast for three final array plans at each town.	

* Parallels Table found in case histories which indicate report compliance to EQEP.

Table B-5 -- continued

DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP REQUIREMENTS*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
	Identify Effects (w-w/o diff) on Indicators (yes-no)	X				No procedure of systematically projecting: (1) a "without plan" future, (2) "with plan" future for each plan, then (3) subtracting s/o from with for a net effect.	
	Describe Effects on Indicators			X		The effects are the "with-plan" futures on specific parameters noted in remarks section. They represent change from present condition, not difference between two futures.	
	Determine Significance of Effects on Indicators			X		Significance of effects on indicators is dispersed throughout report in acknowledging concerns of other agencies. No deliberate system of classification and display.	
	Appraise (beneficial-adverse) Effects on Indicators				X	Approximate satisfaction of new requirements is due to earlier requirement to display system of PAS accounts. Adequacy of resource/indicators is frequent question.	
	Appraise (describe) Effects on Attributes			X		No general appraisal of resource categories net effects (as distinct from indicators) was made. However, summary judgment for selected plans was made stating that net effects were small, if any.	
GRAYS HARBOR	Identify Resources			X		Criteria for identification of resources not articulated but estuary is approached as system. Conventional encyclopedic list of published species also used. Estuarine functions and commercial fisheries help orient.	Reproduction of species lists from Washington Environmental Atlas.
	Develop Framework for Evaluation		X			Use of Estuarine Functions perspective and the food web concept gave some coherence or logic, but served what to discuss, not how to go about assessment measuring evaluation.	
	Specify Past Trends and Existing Conditions for Indicators		X			Some of literature on this major U.S. estuary drawn upon in description but no past constructed for critical indicators.	
	Forecast Without-Plan Futures for Indicators	X				Cannot construct future values for indicators of resources from the report of EIS texts.	

* Parallels Table found in case histories which indicate report compliance to EQEP.

Table B-5 -- continued

DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP REQUIREMENTS*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
	Forecast With-Plan Futures for Indicators		X			This is roughly done by differentiating between ocean or tidelands disposal plan. Disturbance of oyster bed and salmon life cycle and developmental impingement on other species are predicted greater or lesser.	
	Identify Effects (w-w/o diff) on Indicators (yes-no)		X			(Same as above)	
	Describe Effects on Indicators		X			(Same as above)	
	Determine Significance of Effects on Indicators		X			Seriousness of changes in food production relationships and industrial impingement on some species implicit. Significant effects would need to be reconstructed from comments in coordination.	
	Appraise (beneficial-adverse) Effects on Indicators			X		This requirement is met to the extent of the system of accounts display.	
	Appraise (describe) Effects on Attributes		X			What really happens to the overall estuarine system under either plan is not very clear from the standpoint of its significance as a national ecological resource.	
HAYSTOWN	Identify Resources		X			The report does not demonstrate substantive consideration of EQ resources.	
	Develop Framework for Evaluation	X				There exists such faint treatment of EQ considerations in the written report as to lead the reviewer to question whether the rudiments of an EQ evaluation framework were considered.	
	Specify Past Trends and Existing Conditions for Indicators		X	X		A discussion of past trends in residential development, subsidence and flood frequency were discussed.	
	Forecast Without Plan Futures for Indicators			X		A U.S. Geological Survey Study was cited and the results of that study regarding future subsidence were discussed.	
	Forecast With Plan Futures for Indicators			X		A U.S. Geological Survey Study was cited and the results of that study regarding future subsidence were discussed.	
	Identify Effects (w-w/o diff.) on Indicators (yes-no)			X		The effects of w-w/o conditions were described, primarily in terms of the effects on housing and number of residents evacuated.	
	Describe Effects on Indicators		X			The effects of fish and wildlife habitats were barely mentioned.	
	Determine Significance of Effects on Indicators	X				Not included.	

* Parallels Table found in case histories which indicate report compliance to EQEP.

Table B-5 -- continued

DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP REQUIREMENTS*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
NORFOLK HARBOR	Appraise (Beneficial/Adverse) Effects on Indicators		X			The report mentioned that there would be a net positive effect on EQ resources.	
	Appraise (Describe) Effects on Attributes		X			Recommended plan would enhance recreational potential in the area.	
	Identify Resources		X			Identification of resources was presumed; treatment of resources was perfunctory.	
	Develop Framework for Evaluation		X			The rudiments of a framework were discussed for Dismal Swamp but even that was incomplete.	A number of resource indicators were used in study that had no bearing on problem being studied (e.g., forest land in study area).
	Specify Past Trends and Existing Conditions for Indicators	X				Only conducted for NED oriented indicators.	
	Forecast Without-Plan Futures for Indicators	X				Simply was not done.	
	Forecast With-Plan Futures for Indicators		X			Briefly mentioned in system of accounts in perfunctory manner.	
	Identify Effects (w-/wo diff) on Indicators (yes-no)		X			Done in very perfunctory manner.	
	Describe Effects on Indicators	X					
	Determine Significance of Effects on Indicators		X			Significance not discussed in any depth.	
CACHE CREEK	Appraise (Beneficial/Adverse) Effects on Indicators		X			Included in perfunctory manner in system of accounts.	
	Appraise (Describe) Effects on Attributes		X			Included in perfunctory manner in system of accounts.	
	Identify Resources				X		
	Develop Framework for Evaluation			X		Habitat evaluation procedures were used which systematically evaluated some of the resources, attributes and indicators. Final evaluation not presented in summary form.	
	Specify Past Trends and Existing Conditions for Indicators		X			Past trends not established very well. Present conditions discussed satisfactorily.	
	Forecast Without-Plan Futures for Indicators	X				Not done for each alternative.	
	Forecast With-Plan Futures for Indicators			X		Done for recommended plan only.	
	Identify Effects (w-/wo diff) on Indicators (yes-no)			X		Done for recommended plan only.	
	Describe Effects on Indicators			X		Presume habitat evaluation procedures take care of this requirement.	

* Parallels Table found in case histories which indicate report compliance to EQEP.

Table B-5 -- continued

DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP REQUIREMENTS*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
TAMPA BAY	Determine Significance of Effects on Indicators			X		HEP methodology employed to part of EQ indicators.	
	Appraise (Beneficial/Adverse) Effects on Indicators			X		HEP gives net effect evaluation for some EQ indicators.	
	Appraise (Describe) Effects on Attributes			X			
	Identify Resources			X		Significance considerations not fully developed.	
	Develop Framework for Evaluation			X		Guidelines and techniques not present for all indicators.	
	Specify Past Trends and Existing Conditions for Indicators			X		Historic trends much stronger in other accounts.	
	Forecast Without Plans Futures for Indicators		X			Future condition not fully portrayed.	
	Forecast With Plan Future for Indicators			X		Generalized treatment. Written at the level of an "executive summary"	
	Identify Effects (w-w/o diff) on Indicators (yes-no)						
	Describe Effects on Indicators		X			Effects location possibly not limited to study area, as defined	
KANSAS CITY	Determine Significance of Effects on Indicators		X			In contrast to what certain public considered significant, i.e., loss of benthic organism was a controversy.	
	Appraise (beneficial-adverse) X Effects on Indicators						
	Appraise Effects (describe) on Attributes			X		Not well treated. Written in rather general terms.	
	Identify resources			X		Discussion of the appropriate amount for resource evaluation was presented.	
	Develop Framework for Evaluation			X		Guidelines for each indicator not stated often; at times implied. Techniques were cited.	The use of scenarios probably meet or exceed the intent of EQEP.
	Specify Past Trends and Existing Conditions for Indicators			X		Not developed for all indicators	
	Forecast Without Plans Futures for Indicators			X		This was well done because it was, in fact, Plan A which was examined thoroughly.	
	Forecast With Plan Futures for Indicators				X	Develop through the use of projections and scenarios of various growth rates	
	Identify Effects (w-w/o diff) on Indicators (yes-no)	X					

* Parallels Table found in case histories which indicate report compliance to EQEP.

Table B-5 -- continued

DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP REQUIREMENTS*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
	Describe Effects on Indicators			X		Effects were generalized but the project scope probably justified this approach	
	Determine Significance of Effects on Indicators			X			
	Appraise (beneficial-adverse) Effect on Indicators						
	Appraise Effects (describe) on Attributes						
LAKE PONTCHARTRAIN	Identify Resources			X		Improvements could have been made to the identification of fish and wildlife resources. Improvements relative to fish & wildlife resources could also have been made for all EQEP requirements.	Water and sediment sampling information was excellent but its application and its importance relative to the decision could have been discussed in more detail.
	Develop framework for evaluation			X		Although a specific framework was not displayed the results of evaluation of most resources imply that logic similar to the new EQEP framework was used.	
	Specify Past Trends and Existing Conditions for Indicators			X		Could have been improved for fish and wildlife resources.	Excellent in terms of trends and history of shoaling and shoreline erosion.
	Forecast without plans futures for indicators			X		Poor forecast of future fish and wildlife resource conditions.	Fairly well documented for shoaling and shoreline change conditions, recreational opportunity conditions.
	Forecast with Plans Futures for Indicators			X		Poor forecast of future fish and wildlife resource conditions.	Fairly well documented for shoaling, shoreline change, and recreational opportunity conditions.
	Identify Effects (w-w/o diff) on Indicators (yes-no)				X		
	Describe effects on indicators		X			Description of effects could have been improved for most indicators except for shoreline changes, shoaling and recreational opportunities.	
	Determine Significance of Effects on Indicators		X			Statements of significance of effects were not provided. However, most effects that were described in detail and are well documented are those that were determined to be significant based on public and institutional recognition.	
	Appraise (beneficial-adverse) Effects on Indicators			X		The feasibility study itself only provided brief identification of beneficial and adverse effects on indicators. No discussion of Net EQ effects was provided.	Discussion of beneficial and adverse effects in the EIS was excellent and felt to be in almost complete compliance with EQEP.
	Appraise Effects (describe) on Attributes			X		Appraisal of effects on ecological attributes was weak except in terms of shoreline erosion.	Appraisal of effects on cultural and aesthetic attributes was generally adequate.

* Parallels Table found in case histories which indicate report compliance to EQEP.

Table B-5 -- continued

DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP REQUIREMENTS*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
LUCKY PEAK	Identify Resources			X		Identification of most resources involved in and around the project was adequate. Too much relative information to them may have been provided. There was very little resource information specific to the proposed powerhouse site.	
	Develop Framework for Evaluation			X		A specific framework was not displayed. However, most resource indicators and units could be identified. There was a significant lack of identified guidelines and techniques.	
	Specify Past Trends and Existing Conditions for Indicators		X			The study did not provide much information relative to historical or trend conditions with the exception of information on flow velocities. This data was somewhat confusing. Discussion of baseline conditions was not fully developed or documented.	
	Forecast Without Plans Futures for Indicators	X				Forecast of without plan conditions for EQ resources was not provided.	There was quite a lot of information relative to forecast of power supply and demand needs.
	Forecast With Plans Futures for Indicators		X			Discussion of with plan conditions was very limited and then generally provided only qualitative rather than quantitative information.	
	Identify Effects (w-w/o diff) on Indicators (yes-no)			X		Developed as a difference between alternative plans but not as a difference between with and without plans.	
	Describe Effects on Indicators			X		Fairly adequate for those indicators measured in units that are easy to identify and project. Only qualitative for other indicators.	
	Determine Significance of Effects on Indicators		X			Statements of significance of effects were not provided. However, most effects that were described were significant. Detailed discussion of the significance of minimum flows was provided, but not adequately addressed in alternative plans discussion.	
	Appraise (beneficial-adverse) Effects on Indicators		X			The only places where effects were described as beneficial or adverse were in the Summary Comparison and System of Accounts tables. These descriptions were minimal. There was no identification of net EQ effects.	
	Appraise Effects (describe) on Attributes		X			The only true appraisal of effect related to EQ attributes concerned loss of recreational areas. This might be identified as cultural. Appraisal of effects on ecological attributes was almost totally ignored.	Appraisal of improved quality of light due to increased power supply was provided.

* Parallels Table found in case histories which indicate report compliance to EQEP.

Table B-5 -- continued

DIFFERENCES BETWEEN REPORT DOCUMENTATION/PERFORMANCE AND NEW EQEP REQUIREMENTS*

STUDY	REQUIREMENT	EXTENT TO WHICH NEW EQEP REQUIREMENTS APPROXIMATED				REMARKS ON PARTIAL DEVELOPMENT	REPORT DOCUMENTATION EXCEEDING EQEP
		NOT INCLUDED	MINIMALLY INCLUDED	PARTLY DEVELOPED	MEETS EQEP		
HUDSON RIVER	Identify Resources		X			Not explicitly conducted according to "200" regs or EQEP	
	Develop Framework for Evaluation				X		Separate reports establishing basis for forecasts, evaluation linking indicators to impacts.
	Specify Past Trends and Existing Conditions for Indicators				X		Part of framework development
	Forecast without-Plan Futures for indicators				X		Done very well for socio-economic related indicators; less data for ecological indicators.
	Forecast with-Plan Futures for indicators				X		(Same as above)
	Identify effects (w-w/o diff)				X		
	Describe effects on indicators				X		Emphasis on quantitative description where possible.
	Determine Significance of Effects on Indicators				X		Significance measured against quantitative standards, criteria change increments, natural environment.
	Appraise (beneficial - adverse) Effects on Indicators				X		
	Appraise (describe) Effects on Attributes			X		New System of Attributes not congruent with previous EQ development	
MOBILE HARBOR	Identify Resources		X			Not conducted explicitly	
	Develop Framework for Evaluation			X		Most explicit evaluation conducted through physical sampling of benthic sediments and hydraulic model.	
	Specify past trends and Existing Conditions for indicators.			X		Only for physical estuarine indicators (sediments, salinity, flows)	
	Forecast Without-Plan Futures for indicators		X			No direct correlation of physical changes to ecology	
	Forecast With-Plan Future for Indicators		X			(Same as above)	
	Identify Effects (w-w/o diff) on Indicators		X			Incomplete development; concentration on salinity, turbidity.	
	Describe effects on Indicators		X			No continuous development of data and impacts.	
	Determine Significance of Effects on Indicators			X		Given selected few indicators, significance well established	
	Appraise (beneficial - adverse) Effects on Indicators			X		Not explicitly stated in report but fairly well in EIS	
	Appraise (describe) Effects on attributes		X			Marginal in system of accounts	

* Parallels Table found in case histories which indicate report compliance to EQEP.

EQ Plan Justification

Background

Both the P&S and EQEP are vague about selecting and justifying an EQ plan, although quite specific about the recommended plan. The P&S state (18 CFR 711.53(b)) that the EQ plan is a "...plan that is judged to reasonably maximize net contributions to the EQ objective..." and to "...alleviate the specific problems and take advantage of the specific opportunities that reflect the EQ objective for the relevant planning area." Other than the national EQ objective of enhancement, preservation, protection, restoration, or improvement of EQ attributes, the requirements for EQ plan selection appear to center on whether the plan:

1. Possesses net beneficial EQ effects.
2. Specifically addresses stated EQ problems and opportunities.

These two requirements should be further traced to their components in order to understand the hidden ambiguities. First, net EQ effects determination is fairly complex. Figure B-2 schematically shows the steps and highlights a hidden dilemma in selecting an EQ plan and the recommended plan. It is clear that during plan formulation, the alternative plans which progress to become candidate plans must demonstrate the four criteria of completeness, effectiveness, efficiency, and acceptability (18 CFR 711.51). A further implication is that the recommended plans have passed these tests; therefore, if the net beneficial NED and EQ effects are optimal, even though the net NED benefits do not outweigh net NED adverse effects, the plan may be recommended as the selected plan.

The existing Corps planning regulations are much more explicit in laying out the requisite components of an EQ plan (ER 1105-2-230) and the requirements for plan evaluation and selection (ER 1105-2-250). The requirements are:

1. Appraise the plan's fulfillment of planning objectives (problems and opportunities).
2. Appraise contributions of the plan to System of Accounts (NED, EW, SWB, RD).
3. Apply evaluation criteria:
 - a. Acceptability.
 - b. Completeness.
 - c. Effectiveness.
 - d. Efficiency.
 - e. Certainty.

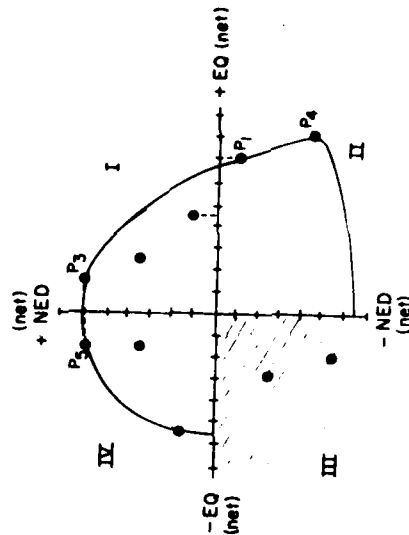
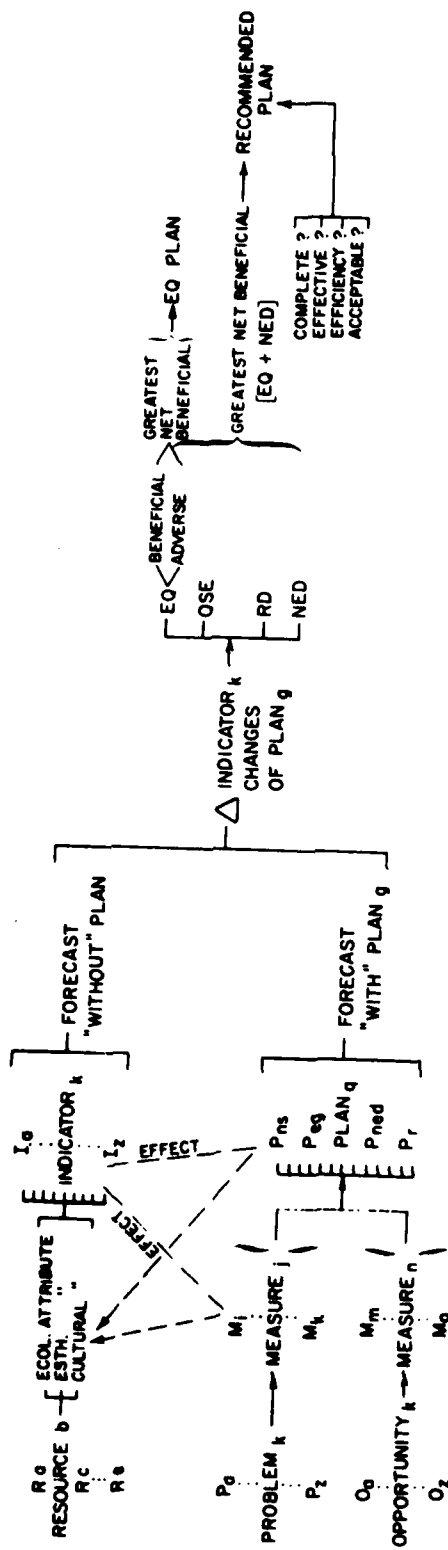


Figure B-2

- UNDER NEW PBS'CEP
- NO PLANS SHOULD BE DEVELOPED IN QUADRANT III
 - QUADRANT I REPRESENTS THE FOCUS OF PBS PLANNING (i.e. positive NED and EQ)
 - P_4 MAY BECOME EQ PLAN - GREATEST NET BENEFICIAL EQ EFFECTS
 - THE FOLLOWING MAY BECOME CANDIDATE PLANS SINCE $P_1 = 7 \text{ EQ} - 1 \text{ NED}$
 $P_3 = 6 \text{ NED} + 2 \text{ EQ}$
 $P_5 = 6 \text{ NED} - 1 \text{ EQ}$
 - IF THERE WAS AN OPTIMAL PLAN SUCH AS P_3 IT WOULD HAVE TO LIE ON THE OPTIMAL BENEFITS CURVE

- f. Geographic scope.
 - g. NED B/C ratio.
 - h. Reversibility.
 - i. Stability.
4. Trade-off analysis (net effects: NED + EQ).
 5. Designate NED, EQ plan.

The major difference appears to be the fact that under the new EQEP guidelines, an EQ plan merely addresses EQ problems and opportunities and maximizes net EQ benefits without apparent concern for NED benefits. Under the current regulations, such disregard for other planning objectives (problems and opportunities) is not allowed. Each plan must minimally pass nine tests, and the plan which has the largest net EQ benefits is designated the EQ plan. Of course, it is often difficult to construct an EQ plan which meets all nine criteria. However, the regulations allow designation of a "least environmentally damaging" plan, and this plan has been used in the majority of survey reports reviewed.

Findings/Conclusions (Refer to Table B-6)

- o Survey studies generally do not emphasize and specify EQ problems and opportunities; as a result, they cannot rationally fulfill the intended elemental requirements of EQ plan formulation, and thus negate the EQ plan designation and justification step.
- o The absence of a clear distinction among EQ planning purposes and between mitigation techniques considerably hampers the field planners in organizing EQ-oriented alternatives along with a complementary rationale.
- o Most studies settled on justifying a "least environmentally damaging plan," or an "EQ-oriented NED plan," or an "environmentally-oriented design plan"; this reflects an attitude that EQ plans cannot possibly contain measures which also meet the nine responsiveness criteria. That is, EQ objectives are inherently incompatible with plan responsiveness criteria.
- o Survey studies demonstrate a definite weakness in the rationale applied for net effects assessment and tradeoff analysis; this ultimately hampers EQ plan designation and selection of the recommended plan.
- o The evaluation rigor imposed by the P&S and EQEP would definitely produce a more rational and traceable application of judgment during the net effects appraisal step of EQ plan designation. However, a great deal of subjective, judgmental leeway exists.

Table B-6
DESIGNATION AND JUSTIFICATION OF A PLAN AS THE EQ PLAN

STUDY	EQ PLAN DESIGNATED		HOW JUSTIFIED AS AN EQ PLAN CONTAINS		ADDRESSES EQ OBJECTIVES	PROVIDES NET EQ BENEFITS
	YES	NO	LED	EQ DESIGN FEATURES		
FOLLY BEACH	X				Improved wildlife habitat, visually enhanced beach	
FOURCHE BAYOU	X			Gabioned channels Tree planting	"Achieves greatest percentage (90%) of EQ oriented planning objectives"	"Most efficient plan for emphasizing EQ outputs"
				Nature Appreciation Area	Protects bottom-lands	
WILMINGTON HARBOR	X				Protects critical ecological zone.	Nine percent increase over without condition, 10% increase over NED Plan conditions.
HOCKING RIVER	X			Watershed land mgmt, scenic corridor, stream cleanout and landscaping.	Avoids further degradation and enhances aesthetic and natural values of river corridor.	Yes (Not selected plan)
				Pools, riffles, rock-piles, acoustical mounds	Single-bank channelization, bypasses, revegetation.	No
GRAYS HARBOR	X		Yes	Spoil Disposal sites and methods to minimize harm.	No	No ("EQ" plan was selected)
CACHE CREEK	X			Bypass would follow a meandering alignment designed to enhance fish and wildlife.	EQ plan would address EQ objectives of state of California and Fish and Wildlife Service.	Habitat evaluation procedures were used to calculate net EQ benefits of recommended plan which contained some EQ feature. HEP method was not used to calculate net effects of EQ plan.
NORFOLK HARBOR		X		All plans were considered to have net adverse effect on EQ.	No EQ objectives stated.	No EQ objectives
BAYSTOWN	X			Nonstructural solutions (i.e., evaluation) were considered because structural solutions were not economically feasible.		NED and EQ plans were considered to have a net EQ benefit. Both plans employed the same measure (i.e., evacuation) only in varying degrees.
TAMPA BAY	X		X	---	---	---
KANSAS CITY		X		---	---	---

LED = Least Environmentally damaging plan.

Table B-6 Continued

DESIGNATION AND JUSTIFICATION OF A PLAN AS THE EQ PLAN

STUDY	EQ PLAN DESIGNATED		HOW JUSTIFIED AS AN EQ PLAN (CONTAINS LED EQ DESIGN FEATURES)		ADDRESSES EQ OBJECTIVES	PROVIDES NET EQ BENEFITS
	YES	NO	LED			
LAKE PONTCHARTRAIN						
(Mouth of Bayou Castine Study Area)	X		LED of alter- natives	Use of hydraulic dredge instead of bucket reduced turbidity. Placement of dredge material for beach construction instead of spoil is an EQ design feature.	None stated for this area	Reduces amount of material required to be dredged for beach construction at Fontaine- bleau State Park if the relationship of the plans for the two areas can be considered as a whole.
(Fontainebleau State Park Study Area)	X		LED of alter- natives	Protection of natural wetland and park land due to reduction in shoreline erosion. Does not require dredging	Protection of natural wetland and park land	Net EQ benefit not stated. However, it does not require dredging but does require transportation of beach material. This will result in associated noise, dust, and road deterioration. The EQ plan was not chosen for this area.
LUCKY PEAK	X	However, from examination of corre- spondence it was not designated in the draft EIS.	LED of alterna- tives	None	No	No
HUDSON RIVER		X	X	Tunnels, treatment plant distribution system, conjunctive use.	Minimizes land use changes. Minimizes streamflow alterations. Minimizes disruption of aquatic ecosystem. Minimizes disruption of archeological, histor- ical sites. Controls growth, distribution Water conservation component.	Recommended plan was an "EQ oriented NEI" plan. EQ benefits at that time were not well established although under current guidance plan could probably be justified as Net EQ benefits
MOBILE HARBOR	X		X		Yes	Total Gulf; open water disposal of dredge material

LED = Least Environmentally damaging plan.

Corps Review Process

Background

The primary Washington-level Corps of Engineers review is conducted by BERH. Therefore, the essential OCE input must be factored in during the planning process through the Intensive Management Program (ER 1105-2-10). The focus for OCE participation is further narrowed to two checkpoint conferences during Stages II and III of the Corps' three-stage planning process.

Stage II Checkpoint Conference (Milestone 04)

The purpose of this conference is to discuss and evaluate study progress, preliminary study results, and detailed matters necessary to facilitate decisions on study direction and redirection. Items covered at the meeting should include, as a minimum:

- o Policy.
- o Economic, social, and environmental impacts.
- o Coordination and public involvement.
- o Plan formulation and rationale.

Stage III Working Checkpoint Conference (Milestone 07)

The purpose of this conference is to discuss plan formulation and study problems and to check key factors that will indicate to reviewers the adequacy of the investigation and analysis. The following specifically should be addressed:

- o Needs identification.
- o Responsiveness of selected plan to needs.
- o Hydrologic and foundation investigations.
- o Alternatives to selected plan.
- o Effect assessments.
- o Public involvement.
- o Local assurances and other institutional factors affecting plan implementation.
- o Cost allocation and policy problems.
- o Proposed actions to complete report.

The sequence of review responsibilities implicitly places the burden of plan formulation and evaluation consistency on OCE. This encompasses the elements of the planning process detailed in the ER 1105-2-200 series of planning regulations. Associated with the general planning requirements is the more specific and, to date, troublesome EQ planning philosophy. On the other hand, BERH may be characterized as being responsible for applying a consistent perspective to policy matters (i.e., determining the Federal interest) and established technical criteria. The two review perspectives might also be classified as one of process and procedure versus one of standards and consistency.

The Board concentrates its review on the recommended plan and evaluates the plan's conformance with accepted practices, interpretations, laws, and precedents. The Board imposes a national-level degree of consistency with respect to the underlying project rationale. BERH is part of the system of checks and balances, reflecting both the time-proven criteria for project evaluation and the current administration policies regarding placing certain emphasis on interpretation. OCE, through its checkpoint meetings and responsibilities for translating laws, executive orders, policy pronouncements, and administrative changes into engineering regulations, possesses a shorter response time to changes in public policies.

The real question is, which of the two key review sectors is responsible for developing the key, consistent, supporting rationale for EQ planning and for monitoring its incorporation into the planning process? Review of the 14 feasibility studies indicates that both elements are needed and are clearly mutually reinforcing. However, several conceptual gaps and impediments must be resolved to gain a clearer understanding of OCE and BERH roles.

The Board primarily insures that conditions for project implementation are consistent on a national level. Unfortunately, implementation rationale is not always congruous with planning rationale and is at the heart of the EQ planning dilemma. The early Stage I and Stage II plan formulation process is purposely conducted at a more abstract diversified level, with various checks to assure feasibility, stability, etc. The Board reflects the pragmatic conditions and constraints of the Federal interest. One of the key pragmatic conditions relating to EQ planning is the rather rigid set of rules pertaining to cost-sharing, i.e., the division of project costs between Federal and non-Federal interests. Generally, EQ enhancement, protection, preservation, and restoration measures are viewed as non-Federal responsibilities.

Another problem stemming from the relatively new ideology of EQ planning is distinguishing between and differentiating among the terms which constitute EQ. Enhancement, protection, preservation, and restoration are not precisely defined. More importantly, real opportunities for matching measures with these nouns are not readily apparent to the field planners. Providing examples of such EQ opportunities for each major Corps function (navigation, flood control, water supply, hydropower, etc.) would greatly clarify these concepts. Among the problematic areas which became apparent during the review of reports was the question of "quid pro quo"; that is, must the EQ features be directly tied to balancing a project impact, and in this case, would it be considered mitigation? Can authorized studies which specify engineering solutions to acknowledged needs be expected to rationally propose nonstructural plans or EQ plans? Can structurally oriented plans ever be rationalized on the basis of net EQ benefits?

Findings/Conclusions (Refer to Table B-7)

o While attempting to impose a consistent economic and environmental rationale on survey reports in a milieu of changing national policies and regulations, BERH is confronted with a series of unresolved policy issues concerning the Federal interest, relationship of separable EQ features, justification of EQ plans, cost-sharing and plan feasibility, and institutional acceptability.

o Recent BERH actions related to EQ planning, enhancement, and mitigation have reduced the ambiguity inherent in policies by establishing dependable precedents.

o The EQEP's positive emphasis on restoration, enhancement, improvement, and preservation in EQ-related actions, measures, and plans may create a period of uncertainty for both OCE and BERH reviewers.

o BERH has often noted serious deficiencies in EQ considerations and recommended that corrective actions be taken, either as amendments to the feasibility document or as conditions during Phase I, GDM.

o OCE and BERH reviews have emphasized the importance of understanding the relationship of the study area to the project impact area and its role in opportunities for EQ plans. Mitigation is more clearly associated with direct, project-related impacts. EQ enhancement, restoration, and preservation opportunities may be more clearly linked to project-induced changes (e.g., navigation improvements leading to port expansion, and both direct and indirect impacts on environmental resources).

o Necessary planning adjustments are better accommodated during intensive planning management under OCE responsibility than at the terminal BERH survey report review phase.

Table B-7

BERH EQ REVIEW CONSIDERATIONS

STUDY	EQ ISSUES OR POINTS RAISED	INFORMATION, REVISION, OR OTHER ACTIONS REQUIRED	BERH ACTION
FOLLY BEACH	Board disagreed with District as to which plan should have been designated as the EQ Plan.	(1) Detailed scenario and assumptions for without project future. (2) Derivation of recreation values and beach carrying capacity. (3) Information per ER 1165-2-26. (4) Board recommended further wildlife studies in post-authorized planning.	Favorable action at first meeting. Recommended Plan approved.
FOURCHE BAYOU	Justification for acquisition of Fourche Bottoms (1750 acres)	(1) Documentation to support proposed acquisition at cost of \$8.3 million when no additional flood protection apparent. (2) Present and future conditions by reach.	First meeting postponed. Deferred at second meeting as Board favored NED plan over recommended plan. Third meeting: Board changed earlier opinion and approved Recommended Plan.
WILMINGTON HARBOR	Justification for acquisition of Critical Ecological Zone (2,800 acres) OCE policy guidance on EQ Planning	(1) How environmental quality effects were determined--provide separate values for baseline, 25 and 50 years. (2) Map of upland industrial area. (3) Documentation supporting linkage between wetland acquisition and navigation project. (4) Analytical backup for curve of cumulative wetland losses. (5) Wetland violations (NOTE: Board review contributed to presentation of EQ analysis.)	Deferred at first meeting, contingent action at second meeting--EQ Plan approved.
HOCKING RIVER	Environmental treatment measures included in the recommended plans (wildlife habitat planting, riffles and deep pools for game fish) were defined as mitigation and additional local cost-sharing was required for them. Cost-sharing was also further required for environmental measures on separable lands for recreation access.		Recommended construction authorization.
GRAYS HARBOR	Exceptional importance of Grays Harbor estuarine functions noted re: salmon, other large fish, birds of Pacific flyway. Objection raised to USFWS failure to provide completed F&W report pursuant to Coordination Act.	Further identification of environmental impacts needed. Further consideration should be given to creation of additional wetlands by use of dredged material (in accordance with Sec. 150 of 1976 W.R.D. Act)	Authorization for channel deepening not recommended; further study required.
CACHE CREEK	(1) Rationale for wildlife refuge was not fully documented. (2) Induced effects of upper basin project on soil erosion downstream not addressed in enough detail.	Approval of plan contingent upon receipt of report detailing the potential for downstream erosion and flood damage.	Cache Creek Study was received 10/26/79. Favorable action was taken by Board during April, 1980 contingent upon submission of additional information requested. Final approval June 4, 1980.

Table B-7 -- Continued
BERM EQ REVIEW CONSIDERATIONS

STUDY	EQ ISSUES OR POINTS RAISED	INFORMATION, REVISION, OR OTHER ACTIONS REQUIRED	BERM ACTION
NORFOLK HARBOR	<p>(1) Channel modification and anchorage facilities in the recommended plan should be implemented with disposal of all suitable material in the ocean.</p> <p>(2) The existing Craney Island Diked Disposal Area should be utilized for dredged material from deepening project which is not suitable for ocean disposal.</p> <p>(3) Post authorization planning studies should be conducted concurrently with the deepening project to identify an acceptable solution for long-term disposal of dredged materials.</p>	<p>BERM personnel developed an addendum to study EIS which brought new EQ information to bear on the project. Results of bio-assays indicate that 73% (200 out of a total 275 million cubic yards over the 50 year life of the project) is presently considered suitable for ocean disposal.</p>	<p>BERM received study on 9/8/80 and the report was approved in November Board meeting. EIS addendum was filed in December, 1980. Recommended plan was changed from recommending Suffolk Disposal site to Ocean Disposal of 73% of dredge.</p>
BAYSTOWN	<p>"Wildlife Habitat would be enhanced in the project area by providing 750 acres of land for recreation and passive uses."</p>		<p>Report was received 3 Oct 75 and passed the Board approved plan during February meeting 1976.</p>
TAMPA BAY	<p>Board disagreed with District proposal of a 400-ft wide channel, which exceeds the normal channel width required for the design vessel. This proposed excess was designed to provide additional clearance for berth vessels and for advanced maintenance due to unstable slide slope material. The Board held that advanced maintenance provisions should be accommodated as justified at the time maintenance is performed and that a channel width of only 300 feet should be recommended for authorization. This recommendation should have proportionally less adverse environmental effect.</p> <p>Several specific EQ issues were raised:</p> <p>a. Temporary resuspension of sediments during dredging operations would create localized reductions in DO, increased turbidity and sedimentation over a 6-month period for the initial maintenance and for two months each six years thereafter.</p> <p>b. Loss of benthos over 80 acres of bottom.</p> <p>c. The need for future, undesignated disposal areas.</p>	<p>The Board held that non-Federal first costs for deepening berthing areas and access channels now estimated at \$132,000 should properly be included in the economic analysis. This added cost does not affect the economic justification.</p>	<p>Except for the changes suggested previously, the Board concurs with the reporting officers at the first meeting.</p>

Table B-7 -- Continued
BERH EQ REVIEW CONSIDERATIONS

STUDY	EQ ISSUES OR POINTS RAISED	INFORMATION, REVISION, OR OTHER ACTIONS REQUIRED	BERH ACTION
KANSAS CITY	No EQ issues raised.	On-going preauthorization study of Brush Creek, MO and KS will contain appropriate recommendations for that element when issued at a later date.	Recommended that no Federal improvements be made at this time; plans are presented for water supply and floodplain management which can be undertaken by local authorities. Recommendation approved at the first meeting.
LAKE PONTCHARTRAIN	<p>Board staff review of initial draft study raised several points related to EQ which were felt to require further investigation and clarification:</p> <ol style="list-style-type: none"> 1. Actual amount of turbidity created by dredging? 2. Clam population lost due to dredging? 3. Value of natural wetland area? 4. Has subsidence occurred along beach? 5. Presentation of detailed information on shoreline lost? 6. Designations of NED-EQ plans. <p>Most did not become major issues.</p> <p>Major issues that were raised by staff and subsequent Board review were:</p> <ol style="list-style-type: none"> 1. What is actual beach lost? 2. Need for better recreation market projections. 3. Reevaluation of beach size. 	<p>Most EQ points raised were taken care of with revisions in text and through communications between staff and Division and District. Due to Board review, Division and District personnel were requested to make further analysis concerning the major issues. This was done and resulted in changes in the size of beach to be constructed at Fontainebleau State Park. Net EQ benefits gained or lost as a result of the revision are not clear.</p>	<p>Initial Board review was conducted prior to first meeting of full Board. Subsequent to this, improvements in analysis of the benefits of recommended plans were requested. These analyses were made and beach construction plan modified. Board concurred with revised recommendations at first meeting of full Board.</p>
LUCKY PEAK	<p>Board staff of study identified two issues related to EQ:</p> <ol style="list-style-type: none"> 1. What is the real significance of decreased Dissolved Oxygen and what will be done to mitigate this effect? 2. What is the significant potential decrease in water temperature in tailrace waters and what will be done to mitigate effect? <p>Otherwise the Board staff felt that the study did consider environmental needs.</p> <p>Other non-EQ issues raised were the need to address recreational needs, if any, and potential limits to the options for project operation if power plant installed.</p>	<p>The Division/District was asked to make further analysis of major issues and prepare comments. Issues were resolved by Division/District in a letter responding to comments. This letter was not attached to the study. Minor modification to text pages were made in light of review comments.</p>	<p>Based on Board staff review and recommendations the Board approved the study in first meeting.</p>
HUDSON RIVER PROJECT	<p>Reflected report recommendations for detailed monitoring studies during Phase I, GDM of following:</p> <ol style="list-style-type: none"> (a) water treatment health impacts (b) entrainment impacts of withdrawals (c) saltfront excursion, control (d) critical low flow conditions (e) monitor program for ecology, water quality (f) construction related impacts (g) develop, coordinate environmental study program 		<p>Recommended for advanced Phase I, GDM study prior to recommendation for construction.</p>

Table B-7 -- Continued
 BERH EQ REVIEW CONSIDERATIONS

STUDY	EQ ISSUES OR POINTS RAISED	INFORMATION, REVISION, OR OTHER ACTIONS REQUIRED	BERH ACTION
MOBILE HARBOR	Dredged material disposal alternatives: Gulf open water disposal. Mitigation measures: Wetlands establishment Restoration of circulation	Additional information development on EQ measures during Phase I, GDM	Endorsed NED plan.

SECTION C

APPRAISAL OF EQ PLANNING

This section addresses some of the EQ-related planning issues which were not covered in the more direct analysis of factors constituting the evaluation framework. The overall conduct of the planning process, traced through the 14 survey reports reviewed, revealed a number of persistently recurring problems. It is worthwhile to list those problems since they reflect difficulties of conformance with a number of planning requirements and because they represent probable future difficulties in meeting the new EQEP requirements.

This section analyzes more closely the role and conduct of EQ planning within the overall planning context. The performance standards suggested in the EQEP for evaluating EQ planning was used in the effort as the framework for analyzing issues such as the general planning process, planning objectives, and consideration of cumulative impacts and project-related issues.

In analyzing and comparing the specific procedural requirements of the new EQEP and existing Corps regulation, frequent reference to forecasting as the focal point of the planning process has been made. OCE must expend a fairly large effort, supported by the Corps research community, to relate the abstract presentation of planning/forecasting to a well-developed, referenced set of forecasting techniques. The Corps' planning regulation preferred analytical forecasting but accepted descriptive statements. The EQEP emphasizes a number of empirically based generic approaches to forecasting. Thus, this emphasis is expected to create the greatest potential difficulty for field planners, especially in those districts where environmental planners are normally not part of the plan formulation effort.

Planning Process

Background

Environmental quality considerations are fully integrated into the overall Corps multiobjective planning (MOP) framework for planning (ER 1105-2-200); this integration is consistent with the WRC Principles and Standards. The EQ evaluation process presented in the EQEP, emphasizes Step 4 (Evaluation) in the six-step P&S water resources planning process. However, each phase (definition, inventory, assessment, appraisal) is parallel to the steps in the overall interactive planning process (see 18 CFR 714.400). Thus, while a semantic difficulty is imposed on the field planners because of a number of new terms (problems and opportunities for planning objectives, actions and management measures for project, etc.), the overall concept of an iterative planning process with evaluation phases is the same.

The EQEP is not substantively different in concept and guidance from the combined series of Corps planning regulations and report organization regulations. However, the EQEP establishes a much clearer level of accountability and decision traceability than the more flexible "200 series" planning regulations. This is bound to improve the EQ planning process as a coequal

component of NED planning. The EQEP imposes a level of rigorous analysis comparable to the NED procedures. While it will be argued that the nonquantifiable nature of many EQ resources creates an analytical incongruity, thereby imposing unnecessary difficulties, many techniques suggested in the EQEP for forecasting are empirically based numeric or quasi-numeric approaches. These are not the same as deterministic, analytical mathematical or numerical models.

Findings/Conclusions

- o Plan formulation rationale was not easily traced in most of the feasibility reports reviewed.

- o For most studies, a "plan of attack" or rationale for an evaluation framework providing concepts, cause-effect relationships, interactive effects, or merely a substantiation of significant trends or problems and requiring an in-depth forecasting of resource conditions, was not developed.

- o NED concerns invariably dominate the plan formulation process and are reinforced at many different phases and activities within the planning process (selection of resources, planning objectives, forecasted variables, assumptions for exclusion, general level of detail).

- o Field planners naturally concentrate their efforts on specifically stated resource management problems (needs) stemming from the emphasis embodied within legislative authorizations, ignoring more generally stated environmental objectives.

- o There is a tendency to use certain guidance and criteria establishing minimal degrees of compliance (e.g., Section 122 impact criteria) as substitutes for the more expansive EQ opportunity initiatives possible under the new P&S and EQEP (restoration, enhancement, etc.).

- o A few legislatively mandated planning and evaluation conditions (e.g., Section 122 impact topics) seem to act as EQ planning process constraints; i.e., they serve as minimal requirements which are further "trivialized" by lack of specificity and quantification.

- o The EQEP, like the Principles and Standards, are written fairly clearly and concisely, but are still somewhat abstract because of the diversity of considerations. Extensive field guidance on a specific, project-related basis must be provided to transform the concepts into operational methods tied to project purposes.

- o The EQEP are valuable procedural guidelines which create an internally consistent planning evaluative framework. The increased rigor inherent in the selection of measurement techniques and displays forces a more traceable and ultimately rational EQ planning philosophy.

o There is a distinct tendency of field planners to put off most analytically oriented EQ planning and evaluation needs to Phase I, GDM.

o There is a real question about the appropriate level of measurement and forecasting to be incorporated within survey scope planning. Evidence and logic seem to indicate that the basis for feasibility study decisions should be existing data, information, concepts, and forecasts. However, this does not imply descriptive analysis, as has been the rule, but rather an empirical development and synthesis of standard practices, concepts, and available data.

o A convenient breakpoint for deciding the appropriate level of measurement techniques could be that physical hydraulic models, new mathematical-numerical models, and other specialized analytical techniques (e.g., environmental monitoring) be reserved for Phase I, AED.

o Despite fairly reasonable OCE guidance on planning and the intensive management system, there are major shortcomings in many Corps planning efforts in the areas of technical credibility, creativity, and adherence to straightforward rules.

o Adherence to the simple report organization requirements of ER 1105-2-920 would have resolved many of the plan formulation traceability shortcomings found in the survey reports.

o Development of an EQ evaluation framework early in the planning process is a critical aspect of evaluation, affecting the selection of indicators, forecasting, "with" and "without" comparisons, net effects assessment, etc. The EQ evaluation framework also implies a good understanding of potential cause-effect relationships, interactive effects and trends, and cumulative impacts. This is perhaps the most difficult requirement of the EQEP to fulfill early in the planning process. Proper scoping must be relied on to aid this critical planning phase.

o Development of integrated guidance during the planning process should begin with minimum, legislated, or required information. For example, Section 122 impact information should be explicitly linked to forecast indicators for "with" and "without" comparison; tracked-through effects assessment to plan appraisal and display in the System of Accounts; and net effects assessment along with EQ plan designation.

Planning Objectives (Problems and Opportunities)

Background

Identification of problems and opportunities is the first step of the six-step planning process. Like so many of the other interlocking requirements of planning and evaluation, this step could determine the outcome of the planning process. Neither the new EQEP nor the Principles and Standards provide an understanding of their fundamental importance for asserting a positive connotation to EQ planning, rather than the currently pervasive "adverse impact" connotation.

Planning objectives are interwoven throughout the planning and evaluation process; therefore, determining the responsiveness of management measures, actions, and plans, as well as the distribution of effects and cost, is very important for developing an understandable, illustrative set of guidelines for the field. The current planning regulation on problem identification in the planning process (ER 1105-2-220) provides more than adequate guidance on establishing planning objectives: "planning objectives should be stated in terms of resource management needs (problems and opportunities) and not as specific levels of resource management outputs that could be provided to satisfy the needs." Early scoping and coordination will invariably have to be emphasized to lay out problems and opportunities that are linked to the resource base.

Findings/Conclusions

- o Specification of planning objectives in general, as well as EQ-oriented planning objectives, is one of the apparent shortcomings of field planners.

- o Instead of planning objectives, the field planners often substitute criteria for evaluating plans which represent environmental constraints, e.g., "minimize degradation."

- o EQ planning objectives, when posed, are often very general in scope, representing broad, philosophical goals, rather than positive enhancement, protection, restoration, and preservation purposes.

- o Public involvement techniques are not used adequately early in the planning process to directly contribute to scoping and identification of the following information needs critical to plan formulation:

1. Identify EQ resources.
2. Identify EQ problems.
3. Identify EQ opportunities.
4. Identify EQ management measures.
5. Identify constraints for the "most probable future."

- o The correct specification of planning objectives is an elemental factor which influences the entire process of formulating and evaluating alternative plans.

- o Planning objectives are especially critical to the fundamental orientation of EQ enhancement, preservation, protection, and restoration opportunities, thereby introducing a positive connotation to EQ planning.

o Planning objectives, however, must be preceded by a similarly positive perspective during the resource management problems and opportunities identification phase, and during the identification and inventory of resources.

o The importance of appropriate formulation of planning objectives is particularly emphasized by the requirement, during plan evaluation, to appraise how well the planning objectives have been fulfilled by each plan; such an appraisal will be a contributing factor toward designating the EQ and NED plans.

o Public involvement techniques, other than formal public meetings, must be structured to derive the appropriate planning information.

Cumulative/Induced Effects

Background

Despite substantial progress in the area of impact analysis, a number of concepts are still not addressed, despite the fact that they are important in assessing appraisal of effects and net effects. Analysis of cumulative and induced effects is explicitly required in NEPA, P&S, and EQEP. This difficult undertaking is needed to answer the questions related to reversibility, retrievability, and the relationship to long-term productivity. Furthermore, this longer-term, comprehensive element of impact analysis might help resolve such EQ purposes as enhancement, restoration, preservation and mitigation.

The requirement for cumulative impact analysis is very difficult, since the CEQ definition requires that the impacts of all actions in the past, present, and reasonably foreseeable future be taken into account, along with the project's incremental effect. While this is the basis of baseline development and future forecasting, the concept has barely been developed to the point of a good working definition of the various ancillary terms (induced, synergistic, interactive, crecive, secondary, indirect, etc.).

Findings/Conclusions

o Many studies did not identify and develop the cumulative/indirect/induced relationships of actions and effects.

o Those studies that attempted a statement of cumulative impact assessment restricted the consideration to hydrologic/water quantity changes.

o Induced effects of project-generated growth or other project outputs were rarely discussed.

o A requirement for cumulative impact assessment is problematic and must be developed at a fundamental R&D level.

o Cumulative impact assessment philosophy is probably more adaptable at the programmatic, generic, or areawide assessment stage, rather than during project-specific analysis.

o Cumulative impact analysis of induced growth can only be handled by land-use modeling linked to basic input/output assumptions about economic growth and the relationship of project outputs to growth.

Project-Related Findings

Background

Invariably, there is always a set of specialized issues, concerns, or constraints which surface during a comprehensive, generic review of a diversity of problem types. In certain areas of the country, some problems are not amenable to the broad, eclectic nature of plan formulation. There are either resource-bearing constraints, or the problem is critical, or the technologies available for solution are constrained. A few of these issues have emerged from the review of survey reports.

Findings

o Some project types, such as flood control and water supply, have evolved over many years of planning and have achieved an analytical proficiency grounded in hydrologic modeling.

o Other projects (e.g., estuarine dredging, beach restoration) rely on fairly simplistic or qualitative, or even spurious techniques. This belies the availability of analytical techniques for saltfront intrusion, sediment transport studies, estuarine circulation, wave erosion, and longshore transport.

o Apparently, there is disagreement in districts between planners and the particular perspective brought in by the engineering staff about analyzing certain problem types. Creation and selection of appropriate management measures is often hampered by the incremental nature of the district's plan formulation process.

o Restoration of EQ resources, rather than enhancement, appears to be a neglected opportunity for EQ planning and management measures, especially in urbanizing environments.

o The field planners often fail to take credit for accepted environmental engineering practices ("environmentally-oriented design features") which may be considered separable EQ management measures. These environmental design features are often integrated into the project's structural components, but may be compared to more mundane standard engineering designs.

Appraisal of selected Corps preauthorization reports for environmental quality planning and evaluation : part I, executive summary / by Eugene Stakhiv... (et al.) -- Champaign, IL : Construction Engineering Research Laboratory ; available from NTIS, 1981.
78 p. (Technical report ; N-118)

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1. Environmental policy. 2. U. S. Army. Corps of Engineers-Environmental aspects. I. Fittipaldi, John J. II. Vincent, Mary. III. Light, Steven. IV. Lacey, Robert M. V. Charles Simpkins. VI. Series : U. S. Army. Construction Engineering Research Laboratory. Technical report ; N-118.